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DRAFT CSO CONCEPTUAL PLAN AND SYSTEM MASTER PLAN

VOLUME TWO CSO STRATEGIES

September 1994

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**DRAFT
CSO CONCEPTUAL PLAN
AND SYSTEM MASTER PLAN**

**VOLUME TWO
CSO STRATEGIES**

September 1994



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SECTION ONE

INTRODUCTION

This volume presents the watershed-based planning approach used to develop and evaluate CSO control alternatives for the MWRA study area, as well as descriptions of the alternatives evaluated and a summary of the recommended alternatives. Together, the individual recommended alternatives for each receiving water segment constitute an overall CSO control strategy. The impacts and interrelationships among the CSO strategy and each of the other strategy areas addressed in the SMP (I/I, transport, and secondary treatment strategies) were evaluated during the CSO strategy development process.

The watershed-based planning approach presented in Section Two involved a series of sequential steps to identify existing and designated uses within receiving water segments, sources of pollutants causing non-attainment of uses, appropriate water body goals, and CSO control alternatives which would control the CSO-component of pollutants causing non-attainment of desired goals. Using a watershed approach was critical in that in many areas, sources of pollutants other than CSO discharges contribute significantly to non-attainment of uses. Addressing CSOs alone is therefore not sufficient to achieve beneficial uses. The watershed-based approach highlights the importance of non-CSO sources of pollution and provides the initial steps towards identification of what sources must be controlled in order to meet existing water quality standards.

The CSO alternatives presented in Section Three represent those alternatives which passed the initial screening process conducted through a series of workshops held in the spring of 1994. The initial screening process involved primarily consideration of the cost, CSO control benefit, and general implementation issues associated with each alternative. The alternatives passing the initial screening process were evaluated in more detail to determine specific water quality benefits, cost/benefit relationships, and siting issues. The alternatives were then developed to a master planning level of detail.

Section Four presents descriptions of the recommended alternative for each receiving water segment, as well as additional details on predicted performance.

SECTION TWO

PLANNING APPROACH

A watershed approach was used for CSO planning. This approach addressed site-specific water quality conditions and CSO impacts, and developed CSO controls for each CSO receiving water. This approach was utilized to be consistent with the USEPA and state CSO policies. It allowed a focussed assessment on the causes of non-attainment of uses in each CSO impacted receiving water, development of site-specific control goals, and development and analysis of CSO control alternatives which addressed the non-attainment.

The watershed approach for CSO planning involved the following major steps:

- Identify receiving water segments (and associated watersheds and CSO systems)
- Assess baseline conditions (pollutant sources and impacts) for each receiving water segment and define causes of non-attainment of uses
- Develop water quality goals for each receiving water segment
- Develop CSO control goals for each receiving water segment
- Develop and screen CSO control alternatives for each receiving water segment, as well as regional and system-wide alternatives
- Assess CSO control alternatives in terms of cost, performance, water quality impacts and siting issues
- Evaluate and rank the CSO alternatives to select the preferred alternatives

Each of the steps in the planning process is described in this section.

RECEIVING WATER SEGMENTS

All of the CSOs in the MWRA and CSO community systems discharge into waterbodies that are classified under the Massachusetts water quality regulations as Class B or Class SB waters. Class SB waters are designated as a habitat for fish, other aquatic life and wildlife, and for primary (swimming) and secondary (fishing and boating) contact recreation. Class SB waters (marine waters) also include restricted shellfishing. The designated beneficial uses are supported by minimum water quality criteria, as well as specific water quality standards for dissolved oxygen, fecal coliform bacteria, solids, toxics, and other parameters. Because of the diversity and geographic separation of the CSO receiving waters, they were divided into the following 14 receiving water segments, shown in Figure 2-1:

- Constitution Beach
- Upper Inner Harbor
- Lower Inner Harbor
- Mystic/Chelsea Confluence
- Upper Mystic
- Alewife Brook
- Upper Charles
- Lower Charles
- Back Bay Fens
- Neponset River
- South Dorchester Bay
- North Dorchester Bay
- Reserved Channel
- Fort Point Channel

BASELINE CONDITIONS

The baseline conditions assessment was performed to identify the causes of existing beneficial use impairment in the CSO receiving water segments and the potential sources of pollutants contributing to the use impairments in these segments. To this end, a matrix was developed for each receiving water segment, identifying existing beneficial uses, a series of use criteria, and under what conditions the criteria are not attained for the given uses. An

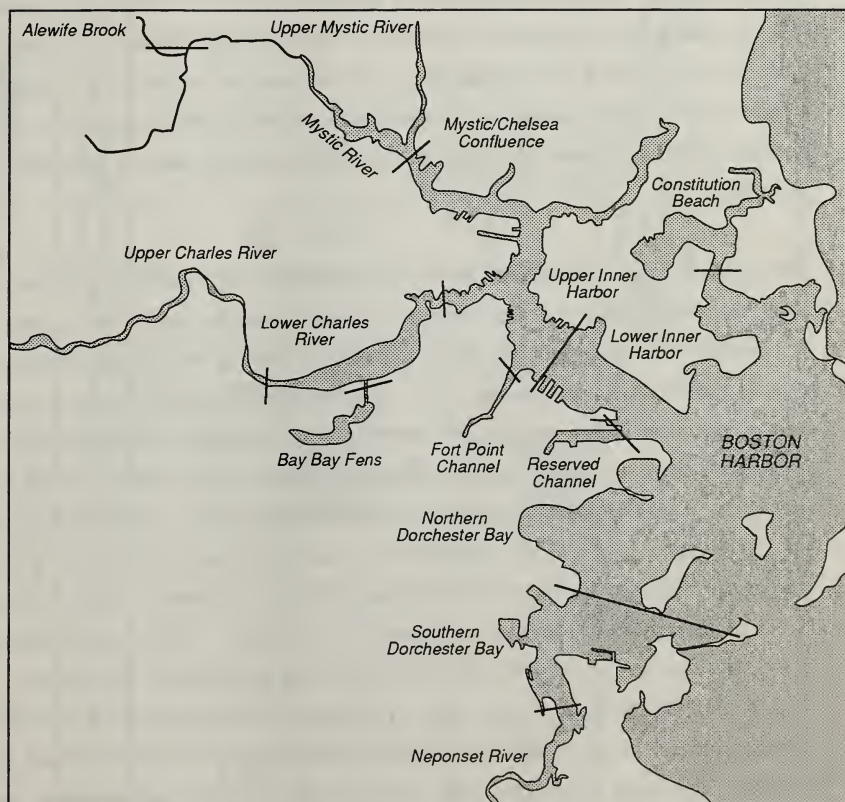


FIGURE 2-1. RECEIVING WATER SEGMENTS

example of this matrix for the North Dorchester Bay receiving water segment is presented in Figure 2-2. As indicated in Figure 2-2, fecal coliform criteria for shellfishing and primary contact recreation are exceeded during wet weather, causing non-attainment of these uses. The dissolved oxygen criterion for aquatic life is also not attained during wet weather, while nutrient loading criteria are exceeded during both dry and wet weather. This indicates that to achieve primary contact recreation and shellfishing uses for North Dorchester Bay wet weather (CSO, stormwater, and non-point source) fecal coliform bacteria loads must be controlled.

Three general sources of pollutant loads were identified for each receiving water segment: CSO, stormwater discharges, and "boundary" sources. Boundary sources are upstream waterbodies which discharge into certain downstream receiving water segments such as the Charles and Mystic River segments. CSO, stormwater, and boundary flows and loads for selected pollutants under future planned conditions were estimated (using various models) for each receiving water segment, and the relative values determined. Figures 2-3 to 2-5 present the relative flows and pollutant loadings for North Dorchester Bay. As shown in Figure 2-3, the CSO fecal coliform bacteria load for the one-year storm is approximately twice the stormwater fecal coliform load; yet as indicated in Figure 2-4, annual stormwater flows to North Dorchester Bay are substantially greater than CSO flows. As indicated in Figures 2-3 to 2-5, however, the annual CSO BOD, TSS, metals and nutrient loads are in closer proportion to the annual stormwater loads. This suggests that controlling CSOs would have a substantial impact on wet weather fecal coliform bacteria loads, but would have less impact on BOD, TSS, metals and nutrient loads. In some other receiving water segments, non-CSO loadings (e.g., stormwater and boundary sources) predominate. In these segments, a critical review of flow and load data indicated that even high levels of CSO control would not enable the attainment of water quality standards.

Quantitative information was developed for each existing CSO outfall and included predicted overflow volumes for existing and future planned conditions for the three-month and one-year storms, as well as the annual overflow frequency and volume. Examples of this

North Dorchester Bay
Class SB

Water Quality Assessment
MWRA CSO/System Master Plan

Use Criteria (1)

Beneficial Uses	D. O.	T	pH	CI	WET	Toxics	BIP	Fecal Coliform	Turbidity	Color	Oil and Grease	Taste and Odor	Nutrients	Floatables	Other
Fish Consumpt.						ok					?	?			FCA for Lobster
Aquatic Life	W	ok		ok	ok	ok ?	ok ?		?		ok		?		
Primary Contact Rec.								W	ok		ok	ok		ok	
Secondary Contact Rec.								ok							
Aesthetics									ok	?	ok	ok	?	ok	
Shell Fishing (Rest.)								W							

WET: Whole Effluent Toxicity

Toxics: Pesticides, Other Organics & Inorganics and Chronic Bioaccum.

BIP: Balanced Indigenous Population

FCA: Fish Consumption Advisory

(1) Use Criteria per WQS and 305(b) Use Attainment Guidelines

Legend: ok Attained for Criteria

W Proven or Probable Non-Attainment

C Wet Weather Non-Attainment

Wet and Dry Weather Non-Attainment

FIGURE 2-2. BENEFICIAL USES AFFECTED BY WATER QUALITY IN NORTH DORCHESTER BAY

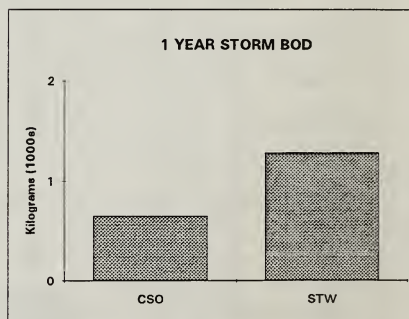
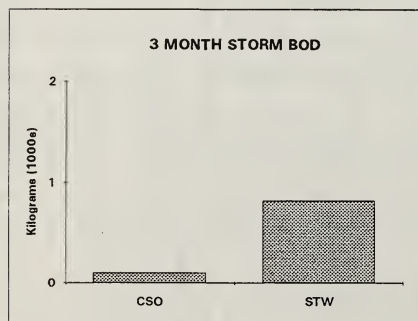
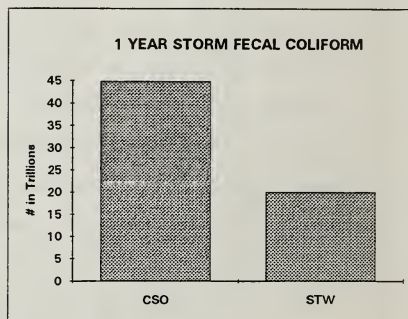
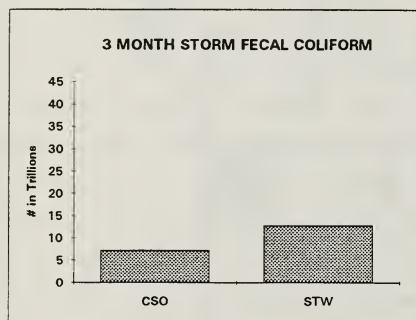
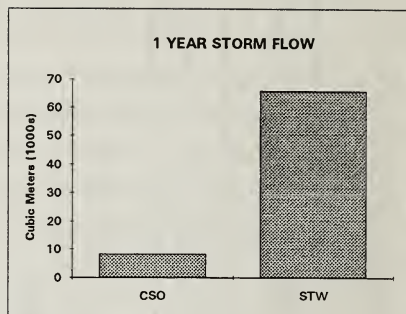
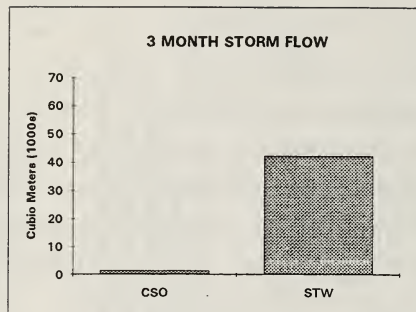


FIGURE 2-3. FLOWS AND LOADS FOR THREE MONTH AND ONE YEAR STORM EVENTS UNDER FUTURE PLANNED CONDITIONS - NORTH DORCHESTER BAY

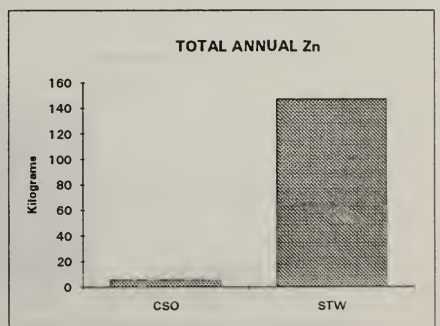
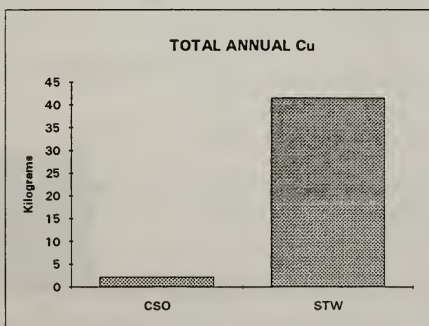
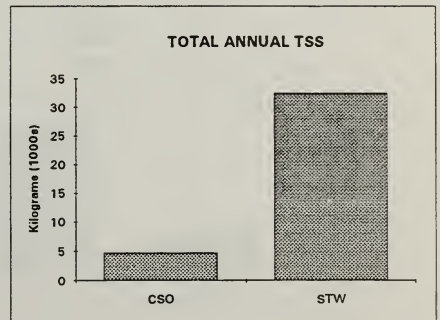
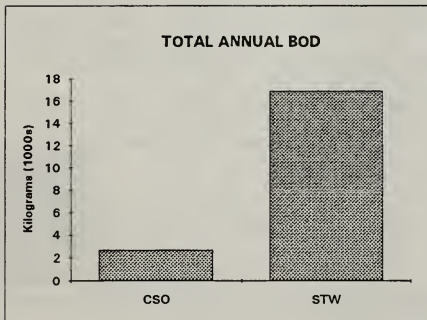
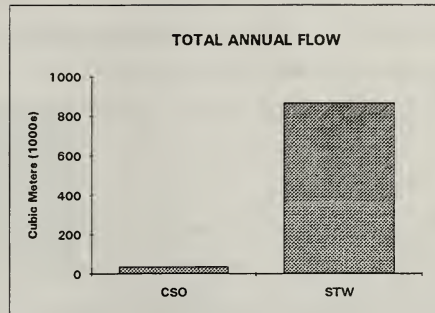


FIGURE 2-4. FLOW, BIOCHEMICAL OXYGEN DEMAND, TOTAL SUSPENDED SOLIDS, COPPER AND ZINC LOADS UNDER FUTURE PLANNED CONDITIONS - NORTH DORCHESTER BAY

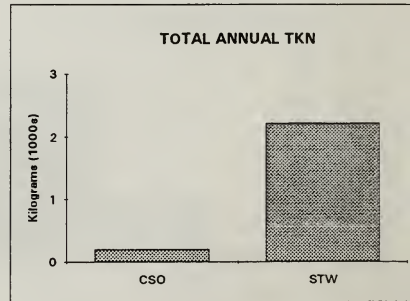
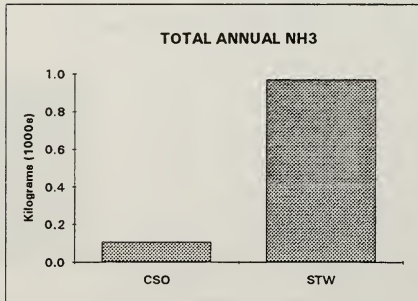
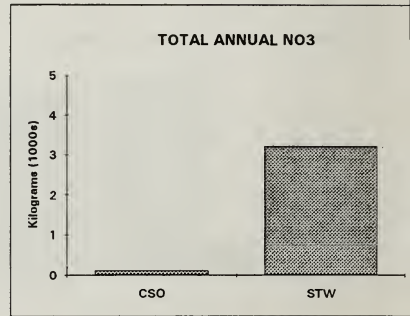
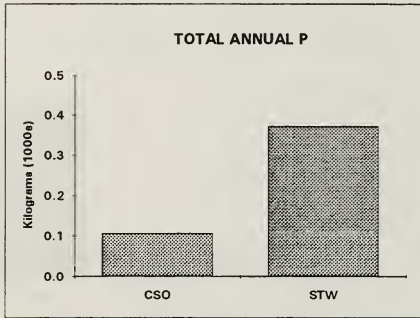
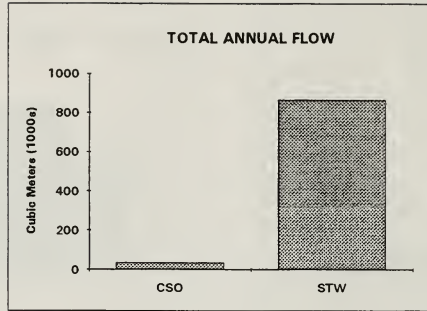


FIGURE 2-5. FLOW, TOTAL PHOSPHORUS, NITRATE, AMMONIA, AND TOTAL KJELDAHL NITROGEN LOADS UNDER FUTURE PLANNED CONDITIONS - NORTH DORCHESTER BAY

information for North Dorchester Bay are presented in Tables 2-1 and 2-2. This provides the current status of CSO discharges, as well as the expected reduction in CSO frequency and volume to be achieved through currently on-going improvements to the transport system, particularly the increased pumping capacity at the North Main Pumping Station at Deer Island.

From Table 2-1, it is apparent that the overflows into North Dorchester Bay are relatively inactive during the three-month storm, and slightly more active during the one-year storm. The improvement between current and future planned conditions is apparent in Table 2-2, where the annual overflow volume is predicted to decrease by 37 percent. This reduction in overflow volume would be due primarily to decreased choking of wet weather flows at the Columbus Park Headworks, which in turn would be a direct result of increased pumping capacity at Deer Island. Implementation of recommended SOPs would also contribute to this reduction in overflow volumes.

WATER QUALITY GOALS

Using the information from the baseline conditions assessment, in conjunction with an analysis of existing or desirable beneficial uses, a range of water quality goals were defined for each receiving water segment. In general terms, these goals were defined as follows:

- Level I: Attain beneficial uses to the fullest extent possible.
- Level II: Attain beneficial uses for most of the year.
- Level III: Attain modest improvements over existing conditions (while other sources of pollution are addressed).

The water quality goals are not constant for all receiving water segments, but rather have been tailored to the beneficial uses and other factors pertinent to a particular receiving water segment. Thus, a Level III water quality goal in one receiving water segment may represent

TABLE 2-1. CSO VOLUMES FOR DESIGN STORMS UNDER FUTURE PLANNED CONDITIONS -
NORTH DORCHESTER BAY

	3 MONTH		1 YEAR	
	Low Tide	High Tide	Low Tide	High Tide
	CSO Volume (MG)	CSO Volume (MG)	CSO Volume (MG)	CSO Volume (MG)
OUTFALL				
BOS 081	0.01	0.00	0.14	0.03
BOS 082	0.18	0.07	0.73	0.68
BOS 083	0.04	0.05	0.23	0.27
BOS 084	0.08	0.00	0.58	0.44
BOS 085	0.00	0.00	0.21	0.16
BOS 086	0.04	0.00	0.30	0.15
BOS 087	0.00	0.00	0.01	0.00
TOTAL	0.35	0.11	2.20	1.72
TOTAL UNTREATED	0.35	0.11	2.20	1.72

TABLE 2-2. ANNUAL CSO DISCHARGE FREQUENCY AND VOLUME – NORTH DORCHESTER BAY

OUTFALL	FUTURE CONDITION: 1/1 – 12/31		PRESENT CONDITION: 1/1 – 12/31	
	CSO VOLUME (MG)	ACTIVATION FREQUENCY	CSO VOLUME (MG)	ACTIVATION FREQUENCY
BOS 081	0.42	12	0.32	13
BOS 082	2.99	22	3.75	28
BOS 083	0.90	13	1.05	14
BOS 084	2.13	19	3.22	15
BOS 085	0.66	4	1.31	12
BOS 086	1.45	78	3.31	80
BOS 087	0.48	3	1.27	9
TOTAL	9.03		14.23	
TOTAL UNTREATED	9.03		14.23	

a higher level of beneficial uses than a Level II water quality goal in another receiving water segment.

Table 2-3 provides an example of the water quality goals and CSO control goals for the North Dorchester Bay receiving water segment, as well as a listing of the types of CSO control alternatives that could achieve the CSO control goals.

CSO CONTROL GOALS

CSO control goals were defined that would contribute to achievement of Level I, Level II, and Level III water quality goals for each receiving water segment. The CSO control goals address only the CSO-related conditions that contribute to non-attainment of beneficial uses. In several receiving water segments, pollution contributed by CSOs is only a fraction of the total pollutant loads from other sources. In these areas, even complete elimination of CSO discharges would not achieve the water quality goals, since the other sources prevent the attainment of beneficial uses. The CSO control goals were developed with the assumption that if the other sources were remediated by the appropriate responsible parties, then the CSO control goals would be stringent enough for water quality goals to be met. In general, CSO control goals were defined as follows:

- Level I: Eliminate all CSOs by sewer separation or relocation of the outfalls
- Level II: Reduce untreated CSOs to about 4 overflows per year.
- Level III: Control floatables and, in some cases, bacteria.

Just as the water quality goals vary with the receiving water segments, the CSO control goals also vary, based on the impact of CSOs on the level of beneficial uses specified for the given receiving water segment. Level II CSO control goals in a less sensitive waterbody may be equivalent to Level III CSO control goals in a more sensitive waterbody, where a high degree of control was desirable to achieve greater water quality improvements.

TABLE 2-3. WATER QUALITY GOALS AND CSO CONTROL GOALS FOR NORTH DORCHESTER BAY

CSO Program Development NORTHERN DORCHESTER BAY			
Control Level	I	II	III
Waterbody Goals	<p>➤ Meet Unrestricted Shell-fishing and Swimming Bacteria Standard (All Times)</p> <p>➤ Meet Aesthetics Criteria</p> <p>➤ Meet D. O. Standard</p> <p>➤ Control Nutrient Load</p>	<p>➤ Meet Restricted Shellfishing and Swimming Bacteria Standard Except 4 (-) Overflows Per Year</p> <p>➤ Meet All Other Level I Goals</p>	<p>➤ No Nutrient Control</p> <p>➤ Meet All Other Level II Goals</p>
CSO Control Goal	➤ Eliminate CSOs	<p>➤ Limit Untreated CSO Discharges to 4 (-) Per Year</p>	➤ Same as Level II Goal
CSO Control Strategies	<p>➤ Sewer Separation</p> <p>➤ CSO Relocation</p>	<p>➤ Partial Separation</p> <p>➤ CSO Relocation</p> <p>➤ Tunnel Storage/Treatment</p> <p>➤ Old BMI/Calf Pasture</p> <p>➤ Stormwater Removal</p>	<p>➤ Storage and Treatment</p> <p>➤ Partial Separation</p> <p>➤ CSO Relocation</p> <p>➤ Tunnel Storage/Treatment</p> <p>➤ Old BMI/Calf Pasture</p> <p>➤ Stormwater Removal</p>

Water quality goals that identified particular site-specific water quality problems were a factor in the development of CSO control goals. For example, the elevated nutrient level in North Dorchester Bay requires that CSO storage be considered as a Level II CSO control, so that beneficial uses can be achieved. Options for CSO treatment and discharge would meet only Level III water quality goals.

The impacts of one receiving water segment on another were also considered in setting CSO control levels. For example, the Upper Mystic River segment receives flow from Alewife Brook, therefore, CSO control goals in the upstream segment had to be consistent with the goals in the downstream segment. The impacts of the Neponset River on South Dorchester Bay is another example of where upstream CSO controls would affect the achievement of downstream control goals.

DEVELOPMENT AND SCREENING OF CSO CONTROL ALTERNATIVES

Once CSO control goals were established to address water quality goals in each receiving water segment, engineering and hydraulic analyses were conducted to develop feasible CSO control alternatives. Alternatives for individual receiving water segments were presented at a series of workshops which were attended by MWRA staff, Project Team staff, Technical Review Team members, CSO community engineering staff, regulatory agency representatives, as well as MWRA Advisory Board and Wastewater Advisory Committee representatives. Alternatives were discussed in detail and screened based on a range of criteria, including cost, performance, construction risks, mitigation concerns, water quality improvements, and short-term and long-term environmental impacts.

Following this process for the 14 receiving water segments, compatible alternatives for the receiving water segments were combined to form regional and system-wide CSO control strategies. The system-wide strategies included alternative tunnel plans that are based on the current assessment of CSO flows and volumes, and a CSO peak shaving alternative. These were compared to the deep tunnel plan recommended in the 1990 CSO Facilities Plan.

Technically and hydraulically feasible alternatives for meeting the CSO control goals were identified based on a detailed knowledge of the layout, hydraulics, and predicted behavior of the conveyance systems tributary to and downstream of the CSO regulators and outfalls. A list was developed of CSO control technologies capable of meeting the range of control goals identified. This list was intended to be representative of a broad range of feasible CSO control technologies and included the following:

- Sewer separation
 - Either upstream of individual regulators ("partial"), or upstream of all regulators in a subsystem ("complete")
- CSO outfall relocation
 - Physical relocation of an outfall from a waterbody with critical uses to a waterbody without critical uses
- Interceptor relief
 - Either enlarging an existing interceptor, or providing a separate relief interceptor
- Near-surface storage
 - Either storage tank facilities, or soft-ground tunnel/conduit storage
- Deep tunnel storage
 - For regional/sub-regional alternatives
- Equivalent primary treatment
 - Assumed to be sedimentation tanks with a peak overflow rate of 2500 gpd/sf, and with disinfection/dechlorination
- Less-than-primary treatment
 - Assumed to be coarse screening facilities with disinfection/dechlorination, or

- Use of existing detention/chlorination facilities with greater than 2500 gpd/sf overflow rate with dechlorination added
- Minimum controls
 - Assumed to be manually or mechanically-cleaned bar screens
- Stormwater controls
 - For certain low-frequency, low-volume CSO discharges, it was assumed that stormwater controls such as flow slipping or upstream detention could control the overflow

Alternative technologies to those listed above, such as swirl/vortex devices, or chemically-enhanced sedimentation were also evaluated on a site-specific basis.

Generalized cost data for the alternatives were developed from cost curves. Costs were updated to a current Engineering News Record Construction Cost Index (ENR CCI). Construction and engineering/administration contingencies were added to construction costs to develop capital costs in accordance with the MWRA's Life Cycle Cost Analysis (LCCA) methodology. Annual operations and maintenance (O&M) costs were also developed based on cost curves.

Using the CSO system hydraulic model output and the water quality and CSO control goals as a guide, initial CSO control alternatives were identified for hydraulically-defined subareas during a series of Project Team brainstorming sessions. Subareas consisting of hydraulically-related outfalls were generally defined as in the June, 1993 SOP Report. In some cases, such as the Alewife Brook receiving water segment, CSOs from the subarea discharged to a single receiving water segment. In some cases, however, either the subarea discharged CSOs to more than one receiving water segment (e.g., East Boston, which discharges into the Mystic/Chelsea confluence, Upper Inner Harbor, and Lower Inner Harbor receiving water segments), or the receiving water segment to which the subarea discharged received discharges from other subareas as well (e.g., Stony Brook and Cottage Farm, which both

discharge into the Lower Charles receiving water segment). Thus, for modeling purposes and for developing alternatives for hydraulically-related regulators and outfalls, the subarea definitions were appropriate. To match the alternatives to water quality and CSO control goals, however, the subareas were then disaggregated into the appropriate outfall groupings by receiving water segment.

Initial alternatives were analyzed using SWMM were analyzed on a subarea basis to evaluate impacts on the hydraulic features of the subarea, and on a receiving water segment basis, to evaluate performance with respect to defined CSO control goals. For Level II and some Level III alternatives, proposed controls were initially sized for both the 3-month and 1-year storms. The performance of Level I sewer separation alternatives were evaluated against both the 3-month and 1-year storm.

In the identification of alternatives, a cursory evaluation of siting potential was performed. Areas where siting was known to be restrictive were identified, but specific sites were not selected for the alternatives. Issues of construction risk, public acceptance, water quality impacts, and short- and long-term environmental impacts were considered for each hydraulically feasible alternative. These factors, along with cost and performance, were presented for each alternative during the workshop sessions described above. An example of the alternative development worksheets presented at the workshops for the North Dorchester Bay receiving water segment is presented in Table 2-4.

During the workshops, input on the various factors was obtained from the participants and the factors were assigned relative ratings (+, 0, -) for the purposes of developing an initial screening of the alternatives. In some receiving water segments, the screening process identified clearly favored or clearly disfavored alternatives, while for other receiving water segments, the results of the screening were less conclusive. The intent of the screening was to identify a manageable array of initially favored alternatives which could be carried forward in the evaluation process.

TABLE 2-4. ALTERNATIVES EVALUATION - NORTH DORCHESTER BAY

EVALUATION FACTOR	CSO CONTROL ALTERNATIVES			
	LEVEL I	LEVEL II - CONTROL OF 1-YEAR STORM		
	COMPLETE SEWER SEPARATION	CSO RELOCATION TO RESERVED CHANNEL (2.7 MG CONDUIT VOL.)	CONSOLIDATED NEAR SURFACE STORAGE FACILITY NEAR CALF PASTURE (0.40 MG TANK VOLUME)	CONSOLIDATED STORAGE AT CALF PASTURE/MOON ISLAND
Cost	Total Construction Cost \$ 49.1 MILLION	Total Construction Cost \$ 35.7 MILLION O & M Cost \$ 1,300,000 / YR	Total Construction Cost \$ 27.5 MILLION O & M Cost \$ 72,000 / YR	Total Construction Cost \$ 29.6+ MILLION O & M Cost \$ 833,000 / YR
Performance	-Eliminates overflow. 3-month; 0.37 MG (\$ 133/gal) 1-year; 3.36 MG (\$ 14.61/gal)	-Provides control for up to the maximum runoff collection capacity of the collection system. 1-year storm (\$ 10.63/gal).	-Provides control for up to the 1-year storm (\$ 8.18/gal).	-Provides control for up to the 1-year storm (\$ 8.81 + /gal).
Construction Risk	-Illegal connections must be identified and eliminated.	-Soft ground tunneling for outfall consolidation/relocation conduit. -Assume screening/pumping facilities at new outfall to Reserved Channel.	-Soft ground tunneling for consolidation conduit.	-Soft ground tunneling for consolidation conduit. -Rehabilitation of storage capacity in Deposit Sewers.
Public Acceptance	-Disruption of streets. -No need to site new facility.	-Public resistance to consolidation work? -Public resistance to siting screening/pumping facility/availability of suitable site?	-Public/private resistance to siting. -Availability of suitable site?	-Public resistance to consolidation work? -New pump station required near existing Calf Pasture P. S.
Water Quality	-Stormwater discharge more frequent and higher volume. -For 3-mo. storm, additional stormwater discharged is 13 percent of total stormwater volume to receiving waters. -Trade off between decrease in CSO and increase in stormwater loads.	-Benefit to North Dorchester Bay; tradeoff of increased load to mouth of Reserved Channel.	-Benefit	-Benefit
Environmental -Construction	-Noise, dust, traffic impacts at locations to be separated.	-Noise, dust, traffic impacts at facility site, and at consolidation tunnel shafts.	-Noise, dust, traffic impacts at facility site, and at consolidation tunnel shafts.	-Noise, dust, traffic impacts at consolidation tunnel shafts, at new p. s. site, and at Deposit Sewers.
-Long Term		-Impacts associated with operation of pumping/screening facilities.	-Impacts associated with facility operation.	-Impacts associated with operation of new pump station and rehabed Deposit Sewers.
Affected Receiving Waters	North Dorchester Bay	North Dorchester Bay Reserved Channel	North Dorchester Bay	North Dorchester Bay

RECEIVING WATER	ANNUAL VOLUME (MG)		3-MONTH STORM VOLUME (MG)	
	CSO	STORMWATER	CSO	STORMWATER
N. Dorchester Bay	9.3	192.0	3.7	67.2

TABLE 2-4 (Contd). ALTERNATIVES EVALUATION - NORTH DORCHESTER BAY

CSO CONTROL ALTERNATIVES				
EVALUATION FACTOR	LEVEL II - CONTROL OF 1-YR STORM		LEVEL II - CONTROL OF 3-MONTH STORM	
	CONSOLIDATED NEAR SURFACE STORAGE CONDUIT (3.49 MG CONDUIT VOLUME)	SOUTH BRANCH, SOUTH BOSTON INTERCEPTOR RELIEF, WITH BMI RELIEF TO CALF PASTURE/MOON ISLAND	CONSOLIDATED NEAR SURFACE STORAGE CONDUIT (1.06 MG CONDUIT VOLUME)	SOUTH BRANCH, SOUTH BOSTON INTERCEPTOR RELIEF, WITH BMI RELIEF TO CALF PASTURE/MOON ISLAND
Cost	Total Construction Cost \$ O & M Cost \$ 24.6 MILLION \$ 90,000 / YR	Total Construction Cost \$ O & M Cost \$ 26.1 + MILLION \$ 749,000 / YR	Total Construction Cost \$ O & M Cost \$ 11.9 MILLION \$ 73,000 / YR	Total Construction Cost \$ O & M Cost \$ 16.8+ MILLION \$ 450,000 / YR
Performance	-Provides control for up to the 1-year storm (\$ 7.32/gal).	-Provides control for up to the 1-year storm (\$ 7.77 +/gal).	-Provides control for up to the 3-month storm (\$ 32.16/gal).	-Provides control for up to the 3-month storm (\$ 45.41 +/gal).
Construction Risk	-Soft ground tunneling for consolidation conduit.	-Open cut or microtunneling to install replacement interceptor upstream of BOS 082; relief interceptor from BOS 082 to the NBMI. -Rehabilitation of storage capacity at Moon Island facilities.	-Soft ground tunneling for consolidation conduit.	-Open cut or microtunneling to install replacement interceptor upstream of BOS 082; relief interceptor from BOS 082 to the NBMI. -Rehabilitation of storage capacity at Moon Island facilities.
Public Acceptance	-Public resistance to consolidation work? -New dewatering pump station required near existing Calf Pasture P. S.	-Disruption of streets. -New pump station required near existing Calf Pasture P. S.	-Public resistance to consolidation work? -New dewatering pump station required near existing Calf Pasture P. S.	-Disruption of streets. -New pump station required near existing Calf Pasture P. S.
Water Quality	-Benefit	-Benefit	-Benefit	-Benefit
Environmental	-Noise, dust, traffic impacts at consolidation tunnel shafts, and at new p. s. site. -Impacts associated with operation of new dewatering pump station.	-Noise, dust, traffic impacts along route of relief interceptor, at new p.s. site, and on Moon Island. -Impacts associated with operation of new pump station and rehabbed storage facilities on Moon Island.	-Noise, dust, traffic impacts at consolidation tunnel shafts, and at new p. s. site. -Impacts associated with operation of new dewatering pump station.	-Noise, dust, traffic impacts along route of relief interceptor, at new p.s. site, and on Moon Island. -Impacts associated with operation of new pump station and rehabbed storage facilities on Moon Island.
Long Term	North Dorchester Bay	North Dorchester Bay	North Dorchester Bay	North Dorchester Bay
Affected Receiving Wetters				

Where appropriate, regional alternatives were identified which impacted more than one subarea, or receiving water segment. These regional alternatives were compared with combinations of subarea or receiving water segment alternatives which collectively achieved the same level of control as the regional alternative. System-wide and regional deep tunnel alternatives were similarly identified. System-wide deep tunnel alternatives were developed to provide control of the 3-month and 1-year storm.

Upon completion of the seven workshops in which CSO control alternatives were presented for each of the fourteen receiving water segments, selected alternatives from each receiving water segment or subarea were combined to create a series of system-wide strategies. These strategies encompassed a range of control goals, from system-wide elimination of CSO outfalls to minimum controls at most outfalls. A total of twelve strategies were initially presented, including three strategies which incorporate deep tunnel storage. These strategies were presented in a separate workshop as a matrix, indicating for each strategy and each receiving water segment or subarea, a specific alternative initially selected to meet the goal of the given strategy. The capital cost for each alternative was presented in the matrix, allowing for a summation of total capital cost for each strategy. These strategies were then refined based on further workshop input and analysis. An updated version of this matrix, which includes the recommended plan ("Strategy M2"), is presented in Figure 2-6, bound in back.

CSO ALTERNATIVES EVALUATION

The final CSO alternatives were then developed in more detail including costs, performance, water quality impacts and siting issues.

Cost of CSO Alternatives

Costs for CSO alternatives were presented in the form of capital and annual O&M costs, and net present worth. Net present worth was computed in accordance with the MWRA's LCCA methodology. Table 2-5 provides an example of the presentation of costs for alternatives in North Dorchester Bay. Cost tables for all receiving water segments are provided in the Appendices. Cost assumptions for CSO control alternatives are as follows:

Capital Costs.

- Construction costs were computed based on SWMM model results (volume, peak flow) or other parameters (conduit length, diameter).
- Cost sources included the EPA Manual, Combined Sewer Overflow Control (EPA/625/R-93/007, Sept. 93) and the MWRA 1990 CSO Facilities Plan.
- The total cost for primary treatment was taken as the sum of the cost for the primary treatment tank, plus disinfection and dechlorination.
- The construction cost is adjusted to a March, 1994 ENR. The LCCA contingencies of 25% for construction and 20% for engineering and construction management were also applied.
- Capital costs for sewer separation were based on cost/acre values developed in CH₂MHill Technical Memorandum No. 7-8 (May, 1989). The computed construction costs were updated to the appropriate ENR index, then burdened with the 25% and 20% contingencies. In Cambridge, the cost/acre values compared reasonably well with the actual cost of ongoing separation work in that community.
- Construction costs for open cut pipe installation (such as for interceptor relief) were based on a unit cost of approximately \$1030/ft (varying with pipe size). The pipe work construction costs were adjusted to the appropriate ENR, and the 25% and 20% contingencies added to develop the capital cost.

TABLE 2-5. COST OF CSO ALTERNATIVES IN NORTH DORCHESTER BAY

	NDB1 Sewer Separation	NDB2 CSO Relocation to Reserve Channel	NDB3 Consolidation/ Storage Conduit (1 Yr)	NDB4 Interceptor Relief; System Optimization 081,082 (1 Yr)	NDB5 Consolidation/Storage Conduit (3 Mo)
Capital Cost \$ Million	80.9	78.9	41.4	22.3	26.5
Annual O&M Cost \$	0	250,000	99,000	0	99,000
Present Worth \$ Million	65	65.9	34.3	18	22.3
Alternative Ranking	3	3	2	1	2

O&M Costs.

- O&M costs for CSO technologies were computed based on SWMM results. "Annual hours of activation" were assumed to be the annual activation frequency x 24 hrs/activation. The computed values were compared with current costs for MWRA CSO Facilities, and were found to be lower, even with ENR adjustments. Multipliers were then added to adjust the O&M costs to a range which seemed reasonable based on the information on current costs. Comparison and adjustment of the costs based on current facilities costs provides calibration of these estimates.

Present Worth Costs.

- The net present worth alternatives was computed in accordance with LCAA guidelines.
- The capital costs and O&M costs for the various technologies comprising an alternative were combined and were also updated to a December 1995 ENR of 6936 (provided by the MWRA).
- To this capital cost, a "Site Factor" was added to obtain a final capital cost. The magnitude of the site factor was estimated based on engineering judgement and a preliminary understanding of siting issues. Following the workshop discussions, site factors at individual locations required some adjustment. Issues such as site access, mitigation requirements, and potential for utility interference contributed to the value of the site factor.
- For present worth of capital costs, the base year was December 1995, and the midpoint of construction was assumed to be January 2003.
- For O&M costs, the base year was December 1995, and the start of operations was assumed to be on January 2004.

Performance of CSO Alternatives

Performance of CSO alternatives was presented as a function of cost, allowing for evaluation of cost/performance relationships, as required in federal and state CSO policies.

Performance factors evaluated in this manner included percent reductions in fecal coliform bacteria, BOD and TSS loads for the three-month and one-year storms. Percent reductions were computed as the reduction in CSO load as a percent of baseline CSO load, and the

reduction in total load as a percent of baseline total load ("baseline" represents future planned conditions). Comparison of these two factors highlighted the relative impact of non-CSO pollutant sources on the receiving water segment. Examples of these cost/benefit relationships for alternatives in North Dorchester Bay are presented in Figures 2-7 and 2-8. Figures showing cost/performance relationships for all receiving water segments are presented in the Appendices. Figures 2-7 and 2-8 represent a cost/benefit analysis using pollutant load reduction as the measure of benefit. Other benefits such as the elimination of outfalls from beach areas were considered in evaluating the alternatives.

In Figure 2-7, sewer separation, CSO relocation, and the two one-year storm control alternatives achieve 100 percent reduction in CSO fecal coliform load, as a percent of the baseline CSO load. The three-month control alternative achieves just under 50 percent removal. Based on this figure, the most cost effective alternative would be interceptor relief with system optimization at BOS081 and BOS082.

Referring to Figure 2-8, the fecal coliform reductions for CSO relocation, and the one-year control alternatives drop to 70 percent of the total load, as these alternatives do not impact non-CSO fecal coliform sources, in particular, stormwater. The overall removal achieved by sewer separation drops to approximately 45 percent, due to the introduction of additional stormwater to the receiving water. In this case, interceptor relief would still be most cost effective, but it is apparent that the water quality goals may not be achieved due to remaining loads from stormwater.

Impact of CSO Alternatives on Water Quality

Performance of CSO control alternatives was also evaluated in terms of receiving water impacts. Based on the existing beneficial uses and associated water quality parameters identified for each receiving water segment (as was presented in Figure 2-2 for North Dorchester Bay), a series of measures were identified to quantify the impact of the CSO control alternatives on water quality. For fecal coliform counts, receiving water modeling

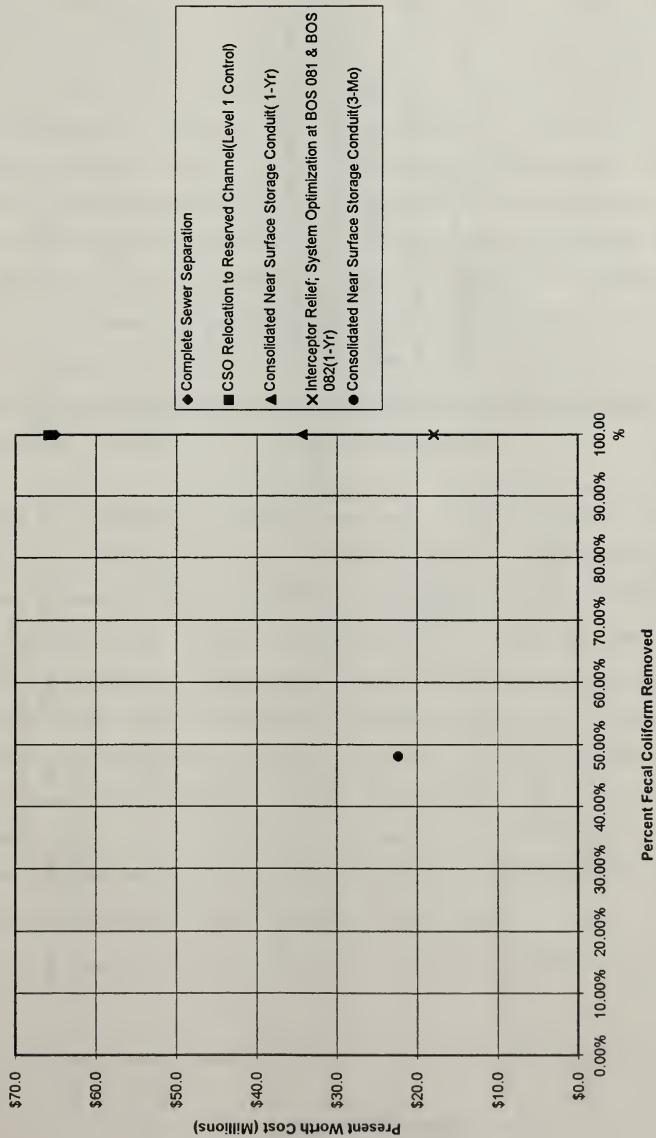


Figure 2-7. CSO Load Reductions as a Percent of Baseline CSO Load (1-Year Storm) - North Dorchester Bay

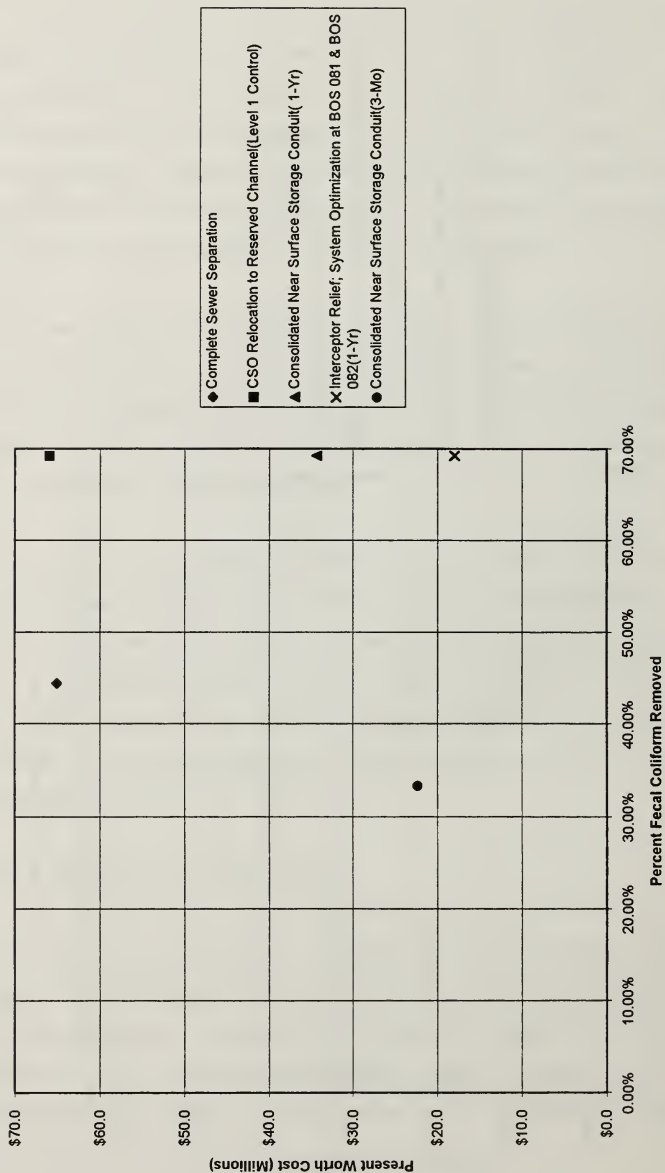


Figure 2-8. Total Load Reductions as a Percent of Baseline Total Load (1-Year Storm) - North Dorchester Bay

predicted the duration of violation of a range of criteria, from unrestricted shellfishing (14 per 100 ml) to secondary contact recreation (1000 per 100 ml), depending on the uses in the receiving water segment. Results from the receiving water modeling are presented in Tables 2-6 and 2-7, and Figure 2-9. Tables 2-6 and 2-7 allow a direct numerical comparison between the hours of violation under future planned conditions, and with two alternative CSO control strategies. One strategy is area-wide sewer separation, while the other, "Strategy M", features a mixed level of control throughout the study area. Individual alternatives comprising Strategy M are presented in Figure 2-6, bound in back. Figure 2-6 also provides a comparison between Strategy M and the recommended plan. The relationships for the restricted shellfishing criterion of 88/100 ml are presented graphically in Figure 2-9. The model data locations at Carson Beach and City Point Beach provide the best reference points for North Dorchester Bay. As can be seen from Figure 2-9, even elimination of the CSOs through sewer separation does not eliminate the wet weather violations to the shellfishing criteria, due to non-CSO sources.

In addition to receiving water modeling, water quality impacts were also evaluated by computing estimated loads to the receiving water segment for selected pollutants, determining the number of remaining untreated overflows, determining the number of outfalls remaining within computed Division of Marine Fisheries closure zones, and other appropriate factors depending on the receiving water segment. Selected performance criteria, including level of control (I, II or III), number of untreated overflows per year, closure of CSOs, and whether the alternative treats stormwater, were also presented. Table 2-8 summarizes the water quality impacts of CSO Alternatives in North Dorchester Bay. As indicated in Table 2-8, the water quality impacts of each alternative can be readily compared with other alternatives, and with future planned conditions. Water quality impact summary tables for the other receiving water segments are included in the Appendices to this volume.

**TABLE 2-6. HOURS OF VIOLATION OF FECAL COLIFORM STANDARDS
UNDER FUTURE PLANNED CONDITIONS - BOSTON HARBOR MODEL**

Simulation	Location	Hours of Violation			
		Shellfish		Beach	Boating
		FC > 14	FC > 88	FC > 200	FC > 1000
Future Conditions	Mystic River	65.2	37.3	23.8	0.0
3 month design storm	Chelsea Creek	65.2	35.2	23.8	0.0
All sources	Charles R. Mouth	71.4	41.4	21.7	0.0
	Ft. Pt. Channel Mouth	66.2	41.4	31.0	0.0
	Middle Lower Harbor	64.2	39.4	25.9	0.0
	Reserved Channel	52.7	21.7	4.1	0.0
	Ship Channel	0.0	0.0	0.0	0.0
	Airport Shellfish	33.1	0.0	0.0	0.0
	Constitution Beach	54.8	33.1	24.8	0.0
	Const. B. Shellfish	55.9	33.1	24.8	0.0
	Pleasure Bay	41.4	0.0	0.0	0.0
	City Point Beach	42.5	8.3	2.1	0.0
	Carson Beach	44.5	18.6	7.2	0.0
	Malibu Beach	75.6	42.5	32.1	0.0
	Tenean Beach	84.8	42.4	36.2	9.3
	Squantum (West)	53.8	17.6	0.0	0.0
	Squantum (East)	24.8	0.0	0.0	0.0

Note: The simulation period was 99.36 hours. "FC" means fecal coliform bacteria count per 100 ml.

**TABLE 2-6 (Cont). HOURS OF VIOLATION OF FECAL COLIFORM STANDARDS
UNDER FUTURE PLANNED CONDITIONS - BOSTON HARBOR MODEL**

Simulation	Location	Hours of Violation			
		Shellfish		Beach	Boating
		FC > 14	FC > 88	FC > 200	FC > 1000
Future Conditions	Mystic River	77.6	46.6	34.2	0.0
1 year design storm	Chelsea Creek	77.6	46.6	34.2	10.4
All sources	Charles R. Mouth	83.9	51.8	38.3	0.0
	Ft. Pt. Channel Mouth	80.8	50.8	40.4	19.7
	Middle Lower Harbor	78.6	49.6	37.2	4.1
	Reserved Channel	66.2	36.2	23.8	0.0
	Ship Channel	8.3	0.0	0.0	0.0
	Airport Shellfish	43.5	5.2	0.0	0.0
	Constitution Beach	60.0	38.3	26.9	0.0
	Const. B. Shellfish	60.1	38.4	28.0	2.1
	Pleasure Bay	53.8	11.4	3.1	0.0
	City Point Beach	55.9	26.9	12.4	0.0
	Carson Beach	54.9	29.0	20.7	5.2
	Malibu Beach	79.8	45.6	35.2	15.5
	Tenean Beach	84.9	46.6	38.3	16.6
	Squantum (West)	58.0	23.8	11.4	0.0
	Squantum (East)	41.4	0.0	0.0	0.0

Note: The simulation period was 99.36 hours. "FC" means fecal coliform bacteria count per 100 ml.

**TABLE 2-7. HOURS OF VIOLATION OF FECAL COLIFORM
STANDARDS FOR COMPLETE SEWER SEPARATION
AND CSO STRATEGY M - BOSTON HARBOR MODEL**

Simulation	Location	Hours of Violation			
		Shellfish		Beach	Boating
		FC > 14	FC > 88	FC > 200	FC > 1000
Sewer Separation	Mystic River	69.3	40.3	27.9	0.0
Future Conditions	Chelsea Creek	69.3	39.3	26.9	0.0
1 year design storm	Charles R. Mouth	71.5	37.3	22.8	0.0
	Ft. Pt. Channel Mouth	60.0	32.1	23.8	0.0
	Middle Lower Harbor	56.9	27.9	15.5	0.0
	Reserved Channel	41.4	3.1	0.0	0.0
	Ship Channel	0.0	0.0	0.0	0.0
	Airport Shellfish	42.5	5.2	0.0	0.0
	Constitution Beach	60.0	38.3	27.9	0.0
	Const. B. Shellfish	59.9	38.2	28.9	1.0
	Pleasure Bay	37.3	0.0	0.0	0.0
	City Point Beach	44.6	10.4	2.1	0.0
	Carson Beach	45.5	20.7	8.3	0.0
	Malibu Beach	75.5	44.5	33.1	8.3
	Tenean Beach	84.9	44.5	34.1	15.5
	Squantum (West)	55.9	20.7	5.2	0.0
	Squantum (East)	30.0	0.0	0.0	0.0

Note: The simulation period was 99.36 hours. "FC" means fecal coliform bacteria count per 100 ml.

**TABLE 2-7 (Cont). HOURS OF VIOLATION OF FECAL COLIFORM
STANDARDS FOR COMPLETE SEWER SEPARATION
AND CSO STRATEGY M - BOSTON HARBOR MODEL**

Simulation	Location	Hours of Violation			
		Shellfish		Beach	Boating
		FC > 14	FC > 88	FC > 200	FC > 1000
Strategy M	Mystic River	69.4	40.4	29.0	0.0
Future Conditions	Chelsea Creek	68.3	40.4	28.0	2.1
1 year design storm	Charles R. Mouth	68.4	36.3	22.8	0.0
	Ft. Pt. Channel Mouth	60.0	32.1	23.8	0.0
	Middle Lower Harbor	56.9	29.0	15.5	0.0
	Reserved Channel	40.3	1.0	0.0	0.0
	Ship Channel	0.0	0.0	0.0	0.0
	Airport Shellfish	42.5	5.2	0.0	0.0
	Constitution Beach	60.0	38.3	27.9	0.0
	Const. B. Shellfish	59.9	38.2	28.9	1.0
	Pleasure Bay	34.2	0.0	0.0	0.0
	City Point Beach	44.5	7.2	0.0	0.0
	Carson Beach	44.5	17.6	3.1	0.0
	Malibu Beach	75.6	43.5	33.1	8.3
	Tenean Beach	84.9	44.5	34.1	15.5
	Squantum (West)	55.9	20.7	5.2	0.0
	Squantum (East)	29.0	0.0	0.0	0.0

Note: The simulation period was 99.36 hours. "FC" means fecal coliform bacteria count per 100 ml.



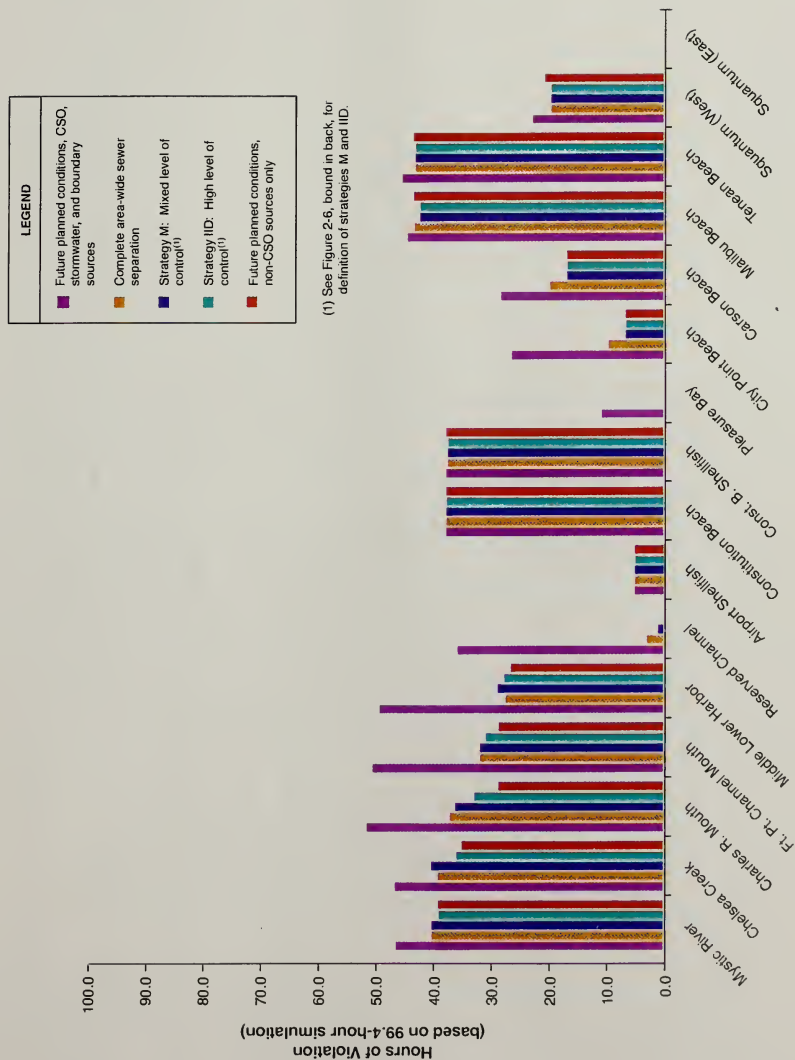


FIGURE 2-9. BOSTON HARBOR, VIOLATIONS TO SHELLFISHING STANDARD OF 88 COUNTS/100ml

TABLE 2-8. WATER QUALITY IMPACTS OF CSO ALTERNATIVES IN NORTH DORCHESTER BAY

Use	Use Attainment	Parameter	Measures	Future Planned Conditions	NDB1 Sewer Separation	NDB2 CSO Relocation to Reserved Channel	NDB3 Consolidation/Storage Conduit (1 Yr)	NDB4 Interceptor Relief; System Optimization 081,082 (1 Yr)	NDB5 Consolidation/Storage Conduit (3 Mo)
Shellfishing	0	bacteria	hours > 14** iii after 1 yr storm	54.9	45.5	44.5	44.5	44.5	
			hours > 88 iii after 1 yr storm	29.0	20.7	17.6	17.6	17.6	
			# outfalls within closure zone active in 1 yr storm	6	0	0	0	0	6 (est.)
Swimming	0	CSO proximity*	total 1 yr storm load (CSO+SWI)	6,477 E13	3,600 E13	1,99 E13	1,99 E13	1,99 E13	4,31 E13
		bacteria	hours > 200 iii after 1 yr storm	20.7	8.3	3.1	3.1	3.1	
Boating	+	bacteria	hours > 1000 iii after 1 yr storm	5.2	0.0	0.0	0.0	0.0	
Aquatic life	0	sediment	CSO+SW load TSS (lbs) after 1 yr storm	9010	9830	5440	5440	5440	6710
			after 3 mo storm	3890	6260	3481	3481	3481	3481
Alternative Performance			Level of Control		I	I	II	II	II
			# Untreated Overflows per Yr.	22 - 78	0	0	1 - 3	1 - 3	4 - 7
			Closure of CSOs		7	7	1 - 4	0	0
			Treat Stormwater		NO	NO	NO	NO	NO

red. = reduction in

Considerations:

* DMF has a formula that calculates closure distance as fcn. of CSO flow, vol. of receiving water segment, and bacteria load (assuming total chormation failure);

number of outfalls indicated are within closure zone for unrestricted shellfishing.

**OPEN shellfishing requires geom. mean fecal coliform counts below 14/100 ml

To avoid toxicity, all chlorinated CSO discharges are assumed to be dechlorinated as well

Reserved Channel currently has pretty good water quality in spite of a large CSO load, to which relocation would add only a little

No aesthetics parameter because currently no CSO associated aesthetic problem observed in N. Dorchester Bay

iii Model data at Caron Beach

0 Indicates non-attainment of use during wet weather

+ Indicates use is attained

Siting Considerations

Potential sites for each CSO control alternative in each receiving water segment were identified and preliminary site investigations conducted by teams of environmental planners and engineers. Field investigations were limited to a visual inspection of the proposed sites. Siting issues evaluated included the existence of a potentially available site (e.g., was a parcel available that could accommodate the CSO control technology); the constructability of a site (e.g., analysis of construction issues and engineering requirements for the proposed CSOS control technology; community impacts, both short-term (construction time period) and long-term (post construction), such as traffic, noise, and odor as well as a preliminary assessment of community acceptance of the impacts; and environmental concerns, including an analysis of natural resources impacts and permitability of the alternative. In addition, other siting factors, such as zoning, presence of endangered species, and potential for the presence of hazardous materials were reviewed for supplementary analysis.

An example of a matrix for siting issues in North Dorchester Bay is presented in Table 2-9. The remaining siting matrices are included in Appendix E of this volume.

Evaluation Process

In order to systematically evaluate the range of data available on each CSO control alternative, rating and ranking systems were developed. These systems evolved to a certain extent during the workshop evaluation process, with the final process involving primarily water quality impacts and costs. For water quality impacts, individual measures of pollutant parameters were rated on a scale of one to three, with the ratings defined as in Table 2-10. Where more than one measure was presented for a given beneficial use, the individual ratings were combined to a single rating for each use. The ratings for each use were then summed and the totals assigned a rating of one to three. Costs were assigned a rating of one to three, based on net present worth. Siting issues were also rated one to three. A rating of one indicated that a site had few, if any, siting problems observed; a rating of two signified

TABLE 2-9. SITING ISSUES FOR NORTH DORCHESTER BAY

PARAMETER	NUMERICAL VALUE/MEASURE	NDB-1	NDB-2	NDB-3	NDB-4	NDB-5	
SITE AVAILABILITY o Vacant land o Park land o Residential o Commercial/Industrial o Vacant industrial	1) Multiple sitelaw restrictions 2) Limited sites/site restrictions 3) No site/severe restrictions	Sewer Separation 373 Acres Primarily in existing ROWs	CSO Relocation to Reserved Channel 1.0 Acres, 11,000 L.F. Conduit Pipe located under beach or Day Boulevard, Farragut Street (appears wide enough), Conley Terminal or Old Power Plant	Consolidation/Storage Pump-out BOS087 0.4 Acres, 7500 L.F. Conduit Pipe located under Carson Beach and/or Day Boulevard, park	Relief of SBI System op. BOS081,082 (1 year) 9500 L.F. Existing SBI-Day Boulevard	Consolidation, Near Surface Storage Conduit (3 month) 0.4 Acres, 7500 L.F. Conduit Pipe located under Carson Beach and/or Day Boulevard	Deep Rock Tunnel Kosulako Circle site for tunnel shaft- light siting issues, road network problems 3 F***
CONSTRUCTIBILITY o Deep Excavation o Tunneling o Special Techniques o Special Hazards o Waste	1) Standard construction 2) Construction constraints 3) Unique &/or special construction required	Typical ROW construction issues	No construction during beach season if on beach, marine terminal facilities may be underground	Soft ground tunnel	Utility relocations	Complex traffic patterns, and difficult	
SHORT TERM COMMUNITY IMPACTS o Traffic impacts o Sensitive receptors	1) Low 2) Moderate 3) Severe	Local street closing	Traffic impacts, beach impacts, BHA housing, residences	Beach, traffic impacts	Traffic impacts on Day Boulevard disruption to bath houses and yacht clubs	Beach, traffic impacts	Bank of Boston, Bayside Expo, extensive road network/traffic issues
LONG TERM COMMUNITY IMPACTS o Public acceptance o Maintenance impacts o Operations impacts	1) Low 2) Moderate 3) Severe	No maintenance or operations impacts	No maintenance or operations impacts. Assuming facility on industrial site	Maintenance and operation impacts with storage and pump-out	Minor maintenance and operation impacts	Minor maintenance and operation impacts	Maintenance and operation impacts (pump station-odors)
ENVIRONMENTAL IMPACTS o Wetlands o Tidelands o Other	1) Low 2) Moderate 3) Severe	Not Applicable	Beach area is a wetland resource	Beach area is a wetland resource	Beach area is a wetland resource	Beach area is a wetland resource	No impacts anticipated
ALTERNATIVE SUMMARY/RATING		7	11	9	7	9	1

* Numerical values: 1 = Few, if any, implementation constraints; 2 = Potentially difficult implementation; 3 = Potentially prohibitive implementation.

** Assuming facility at Conley Terminal

*** F signifies condition may preclude use of site

TABLE 2-10. DEFINITION OF WATER QUALITY RATING FACTORS

WATER QUALITY IMPACT RATING SYSTEM

ATTAINMENT STATUS	SYMBOL	ATTAINMENT WITH CSO ALTERNATIVE		
		IMPROVES (30% REDUCTION)	SAME	DEGRADES
Non-Attainment of Use Wet and Dry Weather	-	1	2	3
Non-Attainment of Use Wet Weather	0	1	2	3
Use Attained	+	1	1	2or3

WATER QUALITY ALTERNATIVE PERFORMANCE RATING SYSTEM

MEASURE	RATING		
	1	2	3
Level of Control	I	II	III
# of Untreated Overflows per Year	0	1 - 7	Same as Future Planned Conditions
Closure of CSOs (#)	All	Some	None
Treat Stormwater	Yes	No	

moderate siting issues or problems; and a rating of three indicated that significant potential problems were noted.

The cost and water quality impact ratings for each alternative were summed, to create an overall rating. The alternative with the best overall rating was generally selected as the preferred alternative, and in most instances one or more alternates were also selected. The siting matrix for the selected alternative was then reviewed to evaluate the feasibility of its implementation. An example of the matrix of water quality impacts showing the various ratings for North Dorchester Bay is presented in Table 2-11.

It should be noted that the rating methodology was intended to be a reasonably uniform and systematic means for evaluating sets of data for each CSO control alternative, but was not intended to be the sole means for selecting a preferred alternative. Once initially preferred alternatives were identified for all receiving water segments through the rating methodology, the resulting system-wide strategy was reviewed as a whole for consistency and appropriateness. For this process, all of the initially-preferred alternatives were presented in a matrix along with three deep tunnel alternatives. Costs for individual alternatives, and total costs for system-wide strategies were also presented. Comments, concerns, and judgements from workshop participants were then solicited and revisions made to the selected alternatives until general agreement was reached as to the overall preferred strategy. In this sense, the rating methodology provided an initial focus for the group evaluation process, but was not the only criterion by which the preferred alternative was identified for each receiving water segment.

For example, in North Dorchester Bay, interceptor relief with system optimization at BOS081 and BOS082 was the initially preferred alternative based on the rating methodology. However, the opinion among workshop participants was that elimination of CSOs from the Dorchester beaches was a desired and worthwhile goal of the CSO program that warranted the additional cost over interceptor relief which would provide control of overflows up to the one-year storm. Since CSO relocation to the Reserved Channel achieved the elimination of

TABLE 2-11. WATER QUALITY IMPACTS OF CSO ALTERNATIVES IN NORTH DORCHESTER BAY

Use	Use Attainment	Parameter	Measures	Futura Planned Conditions	NDB1 Sewer Separation	NDB2 CSO Relocation to Reserved Channel	NDB3 Consolidation/Storage Conduit (1 Yr)
Shellfishing	0	bacteria*	Measures hours > 14*** ⁽¹⁾ after 1 yr storm hours > 88 ⁽¹⁾ after 1 yr storm # outfalls within closure zone active in 1 yr storm	54.9 29.0 6	(2) 45.5 20.7 0	(2) 44.5 17.6 0	(2) 44.5 17.6 0
Swimming	0	bacteria	total 1 yr storm load (CSO+SW) hours > 200 ⁽¹⁾ after 1 yr storm	6.47 E13 20.7	3.60 E13 (1) 8.3	1.99 E13 (1) 3.1	1.99 E13 (1) 3.1
Boating	+	bacteria	hours > 1000 ⁽¹⁾ after 1 yr storm	5.2	(1) 0	(1) 0	(1) 0
Aquatic life	0	sediment	CSO + SW load TSS (lbs) after 1 yr storm after 3 mo storm	8,010 3,890	(3) 9,830 6,260 (3)	(1) 5,440 3,481 (2)	(1) 5,440 3,481 (2)
Alternative Performance							
Level of Control					I	II	II
# of untreated overflows/yr				78	0	0	1 - 3
Closure of CSOs				0	8	7	1 - 7
Treat stormwater				N	N	N	N
Alternative Summary Rating					7	5	5
Alternative Ranking					2	1	1

*The duration of simulation period was 99.4 hours.

** DMF has a formula that calculates closure distance as fcn. of CSO flow, vol. of receiving water segment, and bacteria load (assuming total chlorination failure); number of outfalls indicated are within closure zone for unrestricted shellfishing.

***OPEN shellfishing requires geom. mean fecal coliform counts below 14/100 ml

To avoid toxicity, all chlorinated CSO discharges are assumed to be dechlorinated as well

Reserved Channel currently has pretty good water quality in spite of a large CSO load, to which relocation would add only a little

No aesthetics parameters because currently no CSO-associated aesthetic problem observed in N. Dorchester Bay

⁽¹⁾ Model data at Carson Beach

0 Indicates non-attainment of use during wet weather

+ Indicates use is attained

TABLE 2-11(con't). WATER QUALITY IMPACTS OF CSO ALTERNATIVES IN NORTH DORCHESTER BAY

Use	Use Attainment	Parameter	Measures	NDB4	NDB5
Shellfishing	0	bacteria*	hours > 14** (1)	(2)	(2)
			hours > 88 (1)	44.5	(2)
			hours > 1 yr storm	(1)	1
		CSO proximity**	# outfalls within closure zone	17.6	(2)
			active in 1 yr storm	0	6 (est.)
Swimming	0	bacteria	total 1 yr storm load	1.93 E13	4.31 E13
			(CSO+SW)	(1)	(1)
			hours > 200 (1)	1	(2)
			after 1 yr storm	3.1	(2)
Boating	+	bacteria	hours > 1000 (1)	(1)	(2)
			after 1 yr storm	0	2
Aquatic life	0	sediment	CSO+SW load TSS (lbs)	(1)	(2)
			after 1 yr storm	5,440	6,710
			after 3 mo storm	3,481	3,481
				(2)	(2)
Alternative Performance			Level of Control	II	II
			# of untreated overflows/yr		
			Closure of CSOs		
			Treat stormwater	0	1 - 7
Alternative Summer Rating				N	N
Alternative Ranking				5	7
				1	2

*The duration of simulation period was 99.4 hours.

** DMF has a formula that calculates closure distance as fcn. of CSO flow, vol. of receiving water segment, and bacteria load (assuming total chlorination failure); number of outfalls indicated are within closure zone for unrestricted shellfishing.

***OPEN shellfishing requires geom. mean fecal coliform counts below 14/100 ml

To avoid toxicity, all chlorinated CSO discharges are assumed to be dechlorinated as well

Reserved Channel currently has pretty good water quality in spite of a large CSO load, to which relocation would add only a little

No aesthetics parameters because currently no CSO-associated aesthetic problem observed in N. Dorchester Bay

(1) Model data at Carson Beach

0 Indicates non-attainment of use during wet weather

+ Indicates use is attained



CSOs without the discharge of additional stormwater associated with sewer separation, CSO relocation replaced interceptor relief as the preferred alternative for North Dorchester Bay.

Data used in the evaluation process, including baseline pollutant loads, cost/performance curves, water quality impact rating tables, cost rating tables, and siting issues for each receiving water segment are included in Appendices A through E, respectively, of this volume.

Using the methodology presented above, the alternatives presented in Section Three were evaluated, and recommended alternatives were selected as presented in Section Four.

SECTION THREE

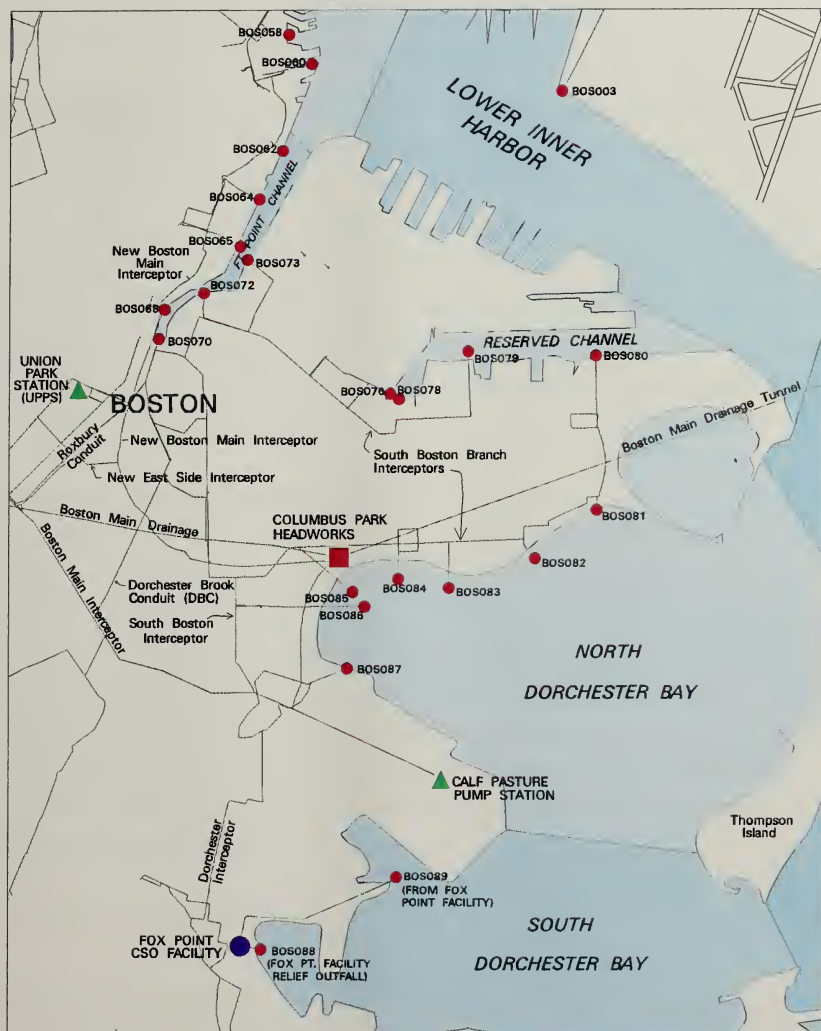
ALTERNATIVES FOR CSO CONTROL

This section presents a description of each of the 14 receiving water segments within the project study area, as well as, the CSO control alternatives evaluated for each segment. The descriptions of receiving water segments include definition of existing water quality standards and designated uses, existing waterbody and adjacent land uses, and an identification of the types and sources of pollutants causing non-attainment of uses. The CSO control alternatives described are only those which were not screened out during the workshops conducted in April through June of 1994. Additional details on these alternatives are available in the June, 1994 report on Alternatives for CSO Control. This section also includes a discussion of regional and area-wide deep tunnel alternatives. The recommended alternative for each receiving water segment is described in Section Four.

NORTH DORCHESTER BAY

Description of the Receiving Water Segment

The North Dorchester Bay receiving water segment extends from the mouth of the Reserved Channel to Columbia Point in Dorchester, including Pleasure Bay and Carson Beach, and offshore to Spectacle and Thompson's Islands (Figure 3-1). This area is classified as SB-Fishable/Swimmable with restricted shellfishing in approved areas. Massachusetts DEP-designated critical uses for this receiving water segment include swimming and shellfishing. Existing water-based uses within this area are primarily recreational and include powerboating and sailboating, swimming, and fishing. Although the Division of Marine Fisheries has identified a significant shellfish resource in the Carson Beach area, shellfishing in this area is currently prohibited due to the fecal coliform levels in the overlying waters and the proximity of the CSOs. Pleasure Bay also contains shellfish beds, which are currently closed for management reasons.



LEGEND



Existing Conduit

Pump Station



CSO Treatment Facility



Headworks



CSO Outfall



Feet 3000

0

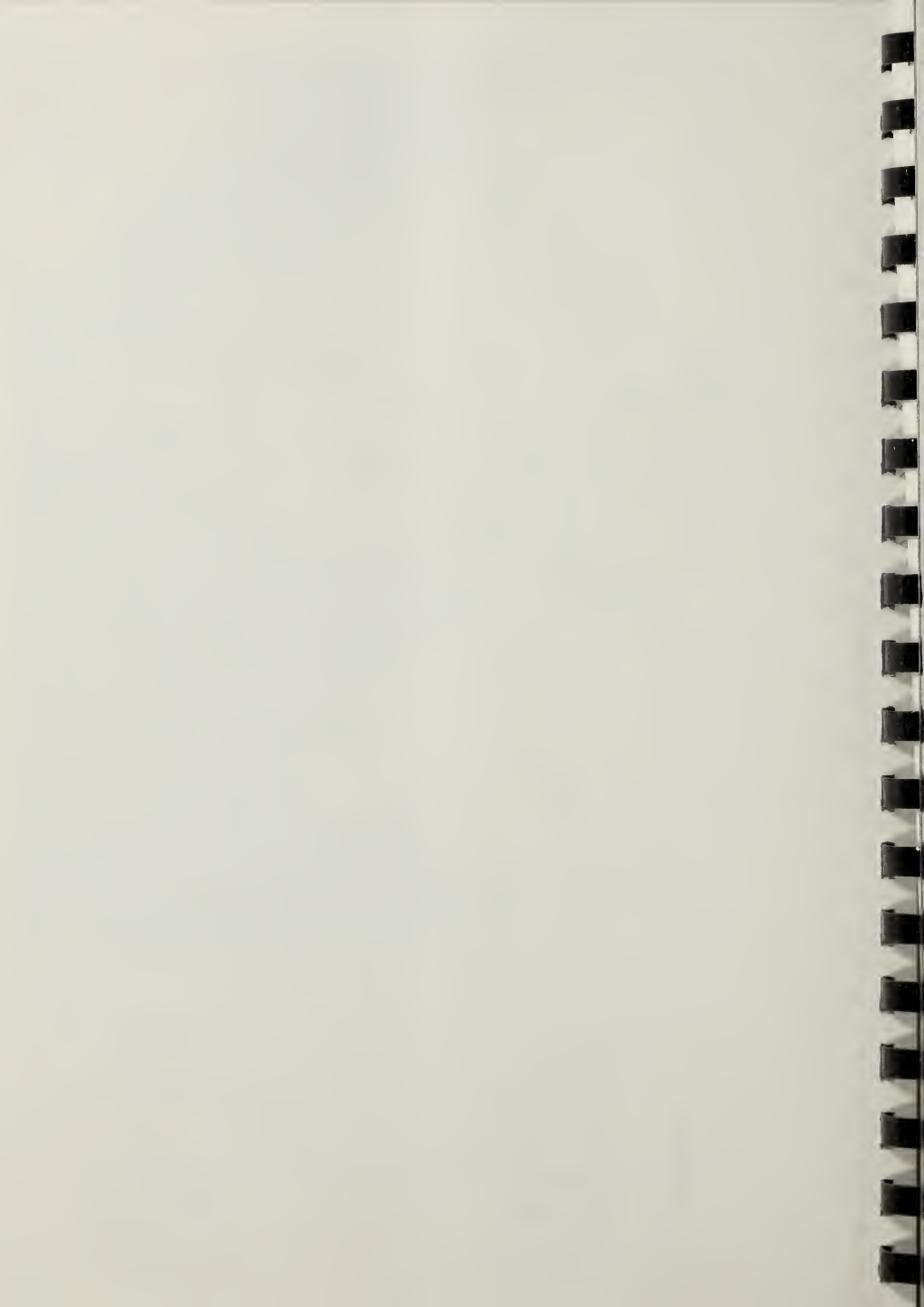
3000

Figure 3-1

Reserved Channel

Fort Point Channel

North Dorchester Bay

















































Many of the land uses along northern Dorchester Bay support water-based recreational uses. The MDC controls much of the waterfront in this area although there are parcels controlled by both the City and by private interests. Much of the waterfront is used for passive recreation, and a number of separate beach areas, some including bathhouse facilities, exist along this area. Some commercial and residential land uses border the waterfront or the beaches. The Southeast Expressway runs adjacent to part of the receiving water segment. The University of Massachusetts at Boston (UMass/Boston) and the John F. Kennedy Library are located at Columbia Point, on the border between the North and South Dorchester Bay receiving water segments.

A total of seven untreated CSOs discharge to North Dorchester Bay. Figure 3-2 presents the total pollutant load and relative contributions to the load from CSO and stormwater for pollutants causing non-attainment of designated uses in North Dorchester Bay. Data is presented in Figure 3-2 for both the 1-year storm and for a typical year. No significant upstream or boundary sources were identified for this receiving water segment. Additional data on pollutant loads from CSO and stormwater sources are presented in Appendix A of this volume. As indicated in Figure 3-2, CSOs are the predominant source of fecal coliform bacteria during the one-year storm, while stormwater has a greater load on an annual basis. For parameters other than fecal coliform bacteria, the loads from stormwater are substantially greater than the loads from CSOs.




Description of CSO Alternatives

The CSO control alternatives evaluated in detail for this receiving water segment are summarized in Table 3-1, along with water quality benefits as compared with future planned conditions, critical siting issues, and costs. Brief descriptions of each alternative are provided below, and additional details on the recommended plan, CSO relocation to Reserved Channel, are provided in Section Four.

FIGURE 3-2. SUMMARY OF FUTURE PLANNED CONDITIONS WATER QUALITY PARAMETERS AND RECOMMENDED CSO CONTROL PLAN BY RECEIVING WATER SEGMENT

	DORCHESTER BAY / NEPONSET RIVER						CHARLES RIVER							
	NORTH DORCHESTER BAY		SOUTH DORCHESTER BAY		NEPONSET RIVER		CONSTITUTION BEACH		UPPER CHARLES RIVER		LOWER CHARLES RIVER		BACK BAY FENS	
EXISTING WATER QUALITY STANDARD ⁽¹⁾	SB		SB		SB		SB		B		B		B	
EXISTING USES	FISHING SWIMMING BOATING AESTHETIC VALUE		FISHING SWIMMING BOATING AESTHETIC VALUE		FISHING BOATING AESTHETIC VALUE		FISHING SWIMMING BOATING AESTHETIC VALUE		BOATING AESTHETIC VALUE		FISHING BOATING AESTHETIC VALUE		AESTHETIC VALUE	
SELECTED USE CRITERIA; AND SOURCES OF POLLUTANTS AND TOTAL POLLUTANT LOAD CAUSING NON-ATTAINMENT ⁽²⁾	1 YEAR	ANNUAL	1 YEAR	ANNUAL	1 YEAR	ANNUAL	1 YEAR	ANNUAL	1 YEAR	ANNUAL	1 YEAR	ANNUAL	1 YEAR	ANNUAL
BACTERIA (FC, count)	6.48E+13	4.46E+14	2.87E+13	3.83E+14	1.41E+14	7.20E+16	6.05E+13	4.89E+14	3.14E+14	1.00E+17	6.13E+14	1.03E+17	1.41E+14	1.21E+15
														
FLOATABLES (CSO & SW VOLUME, MG)			44	494					212	3,031	158	1,778		
														
DO (BOD, lbs)	4,255	42,953	16,727	162,158							130,843	9,232,323	12,932	160,210
														
NUTRIENTS (TOTAL P, lbs)			594	5,486	392	44,252			1,032	64,086	2,132	68,627	321	3,589
														
TOXICS (Cu, lbs)			20	220	33	2,484			97	3,786	97	3,756		
														
RECOMMENDED WATER QUALITY GOAL	- Meet unrestricted shellfishing and swimming bacteria standards - Meet aesthetic criteria - Meet DO standard - Control nutrients		- Meet restricted shellfishing bacteria standards - Meet aesthetic criteria		- Meet restricted shellfishing bacteria standards - Meet aesthetic criteria		- Meet unrestricted shellfishing bacteria standards - Eliminate potential Chlorine toxicity		- Meet swimming bacteria standards except for ± 4 overflows per year - Meet aesthetic criteria		- Meet swimming bacteria standards except for ± 4 overflows per year - Meet boating stds. - Meet aesthetic criteria - Improve DO - Reduce nutrients - Reduce metals		- Meet Class B water quality standards except for less than 4 overflows per year	
RECOMMENDED CSO CONTROL PLAN	CSO Relocation to Reserved Channel		Upgrade Existing Facilities to Dechlorination Sewer Separation		Sewer Separation		Sewer Separation		Screen and Disinfect CAM005, CAM009 and BOS032		Screen and Disinfect Stony Brook Conduit; Upgrade Cottage Farm screens, dechlorination, outfall		Coarse Screen	

⁽¹⁾ Designated uses for Class SB water include: Aquatic life habitat, Primary Contact Recreation (swimming), Secondary Contact Recreation (boating), Restricted shellfishing, and Aesthetic value
Designated uses for Class B water include: Aquatic life habitat, Primary Contact Recreation (swimming), Secondary Contact Recreation (boating), Public water supply (with treatment),
Irrigation/agricultural uses, Industrial cooling/process uses, and Aesthetic value

⁽²⁾ Where a designated use criteria is currently not attained, the relative contributions of sources of the pollutant causing non-attainment are represented by the pie charts.
Where no pie chart is indicated, the use is currently attained. The pie charts are color coded as follows:  CSO  STORMWATER  BOUNDARY OR UPSTREAM FLOW, IF APPLICABLE

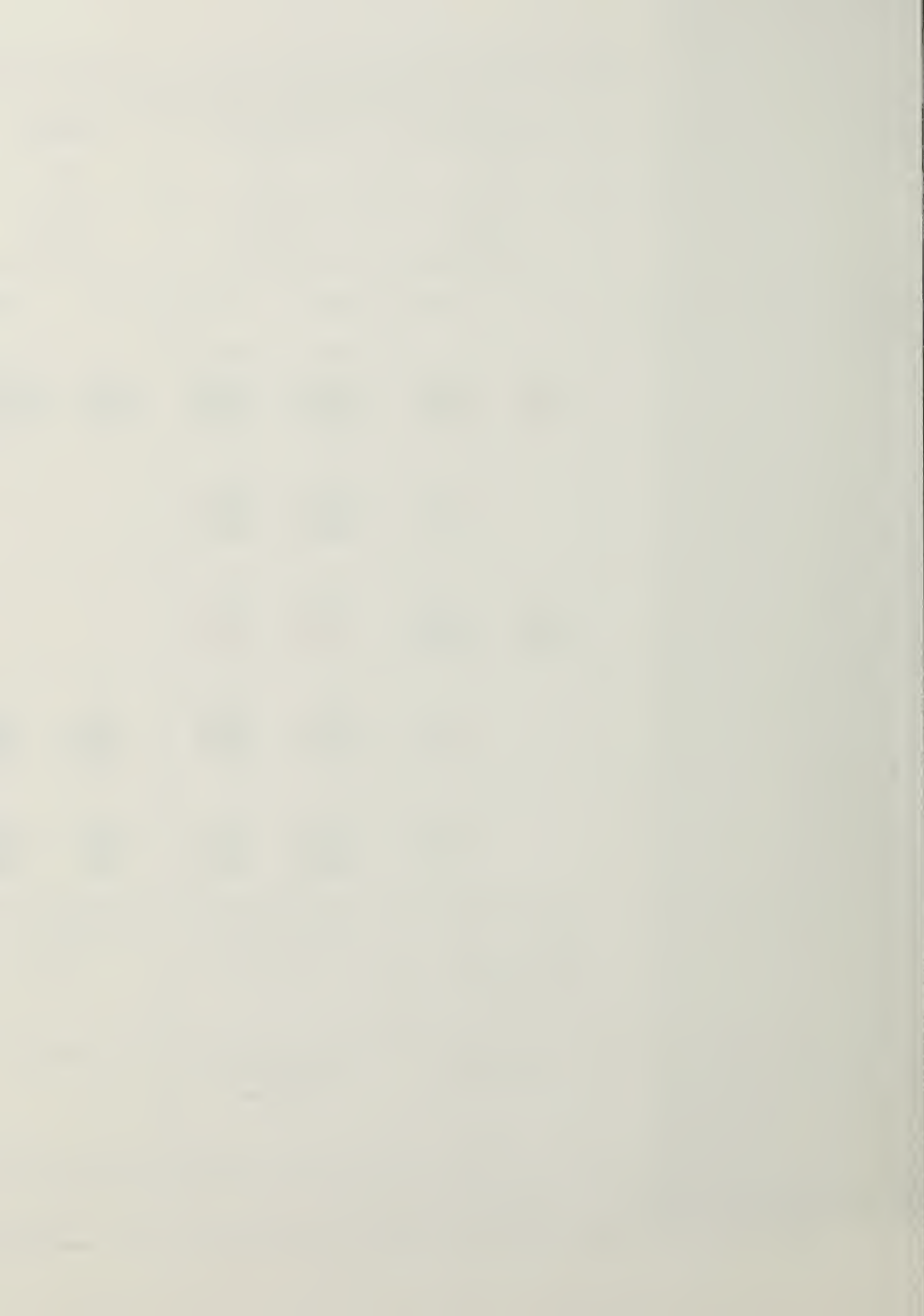


FIGURE 3-2 (continued). SUMMARY OF FUTURE PLANNED CONDITIONS WATER QUALITY PARAMETERS AND RECOMMENDED CSO CONTROL PLAN BY RECEIVING WATER SEGMENT

	ALEWIFE BROOK / UPPER MYSTIC RIVER				BOSTON HARBOR									
	ALEWIFE BROOK		UPPER MYSTIC RIVER		UPPER INNER HARBOR		LOWER INNER HARBOR		MYSTIC/CHELSEA CONFLUENCE		RESERVED CHANNEL		FORT POINT CHANNEL	
EXISTING WATER QUALITY STANDARD ⁽¹⁾	B		B		SB		SB		SB		SB		SB	
EXISTING USES	FISHING BOATING AESTHETIC VALUE		FISHING BOATING AESTHETIC VALUE		FISHING BOATING AESTHETIC VALUE		FISHING BOATING AESTHETIC VALUE		FISHING BOATING AESTHETIC VALUE		FISHING BOATING AESTHETIC VALUE		FISHING BOATING AESTHETIC VALUE	
SELECTED USE CRITERIA; AND SOURCES OF POLLUTANTS AND TOTAL POLLUTANT LOAD CAUSING NON-ATTAINMENT ⁽²⁾	1 YEAR	ANNUAL	1 YEAR	ANNUAL	1 YEAR	ANNUAL	1 YEAR	ANNUAL	1 YEAR	ANNUAL	1 YEAR	ANNUAL	1 YEAR	ANNUAL
	1.82E+14	1.52E+15	2.10E+14	2.02E+16	1.85E+14	1.06E+17	2.01E+14	3.93E+14	2.44E+14	2.34E+16	1.83E+14	1.47E+15	6.09E+14	3.97E+15
BACTERIA (FC, count)														
FLOATABLES (CSO & SW VOLUME, MG)	72	1,019	183	2,717	70	616	95	127	137	1,798			65	653
DO (BOD, lbs)	6,483	174,546	42,638	1,239,490	155,696	9,585,064	27,450	784,196	60,157	2,236,458			24,125	187,723
NUTRIENTS (TOTAL P, lbs)	374	4,056	818	19,820	1,980	68,184	210	1,610	1,030	21,306	246	2,049	847	6,044
TOXICS (Cu, lbs)	29	410	81	1,609	77	3,480	48	494	68	1,378			123	282
RECOMMENDED WATER QUALITY GOAL	<ul style="list-style-type: none">- Meet swimming bacteria standards except for ± 4 overflows per year- Meet DO stds.- Meet aesthetic criteria- Control nutrients- Control toxics		<ul style="list-style-type: none">- Meet swimming bacteria standards except for ± 4 overflows per year- Meet boating stds.- Meet aesthetic criteria		<ul style="list-style-type: none">- Meet swimming bacteria standards except for ± 4 overflows per year- Meet DO stds.- Meet aesthetic criteria- Reduce toxics		<ul style="list-style-type: none">- Meet swimming bacteria standards except for ± 4 overflows per year- Meet DO stds.- Meet aesthetic criteria- Reduce toxics		<ul style="list-style-type: none">- Meet swimming bacteria standards except for ± 4 overflows per year- Meet DO stds.- Meet aesthetic criteria		<ul style="list-style-type: none">- Meet swimming bacteria standards except for ± 4 overflows per year- Meet aesthetic criteria		<ul style="list-style-type: none">- Meet swimming bacteria standards except for ± 4 overflows per year- Meet aesthetic criteria	
RECOMMENDED CSO CONTROL PLAN	Separate CAM004 Tributary Area		Sewer Separation at SOM007; Storage at the Somerville Marginal Facility		Relieve East Boston Branch Sewer; Coarse Screen BOS050-060; 3 mo Storage at BOS019; dechlor. at Prison Point		Relieve East Boston Branch Sewer		Screen and Disinfect BOS014, BOS017 and CHE008; Interceptor Relief for CHE002-004		Consolidate, Screen and Disinfect near BOS080		Detention/Treatment at Union Park Pump Station; Storage at BOS072&073 Coarse Screen BOS062-068; Storage Dorchester Conduit	

⁽¹⁾ Designated uses for Class SB water include: Aquatic life habitat, Primary Contact Recreation (swimming), Secondary Contact Recreation (boating), Restricted shellfishing, and Aesthetic value
Designated uses for Class B water include: Aquatic life habitat, Primary Contact Recreation (swimming), Secondary Contact Recreation (boating), Public water supply (with treatment),
Irrigation/agricultural uses, Industrial cooling/process uses, and Aesthetic value

⁽²⁾ Where a designated use criteria is currently not attained, the relative contributions of sources of the pollutant causing non-attainment are represented by the pie charts.

Where no pie chart is indicated, the use is currently attained. The pie charts are color coded as follows:

CSO STORMWATER BOUNDARY OR UPSTREAM FLOW, IF APPLICABLE

**TABLE 3-1. COMPARISON OF RECOMMENDED PLAN AND OTHER
CONTROL ALTERNATIVES FOR NORTH DORCHESTER BAY**

Evaluation Criteria	Future Planned Conditions	Alternatives			
		Recommended Plan CSO Relocation to Reserved Channel	Complete Sewer Separation	Consolidation Near Surface Storage Conduit (Sized for 1 Yr. Storm)	Consolidation Near Surface Storage Conduit (Sized for 3 Mo. Storm)
Water Quality Benefit (1)					
• Unrestricted Shellfishing (Bacteria Std. Exceedance, hrs.)	54.9	44.5	45.5	44.5	44.5
• Restricted Shellfishing (Bacteria Std. Exceedance, hrs.)	29.0	17.6	20.7	17.6	17.6
• Boating (Bacteria Std. Exceedance, hrs.)	5.2	0	0	0	0
• Swimming (Bacteria Std. Exceedance, hrs.)	20.7	3.1	8.3	3.1	3.1
• Aquatic Life (Solids Load, lbs.)	8,010	5,440	9,830	5,440	6,710
• Performance (Untreated Overflows, no./yr.) (Closure of CSOs)	78 0	0 7	0 7	1-3 0	4-7 0
Critical Siting Concerns		Impacts traffic beach use, and residences	Local street closings during construction	Impacts traffic and beach	Impacts traffic and beach
Capital Cost (millions)		\$79.0	\$80.9	\$38.4	\$24.5
Annual O & M Cost		\$2,226,000	\$0	\$99,360	\$99,360

1. The following notes apply to the measures of water quality benefit:

- Bacteria standard exceedance hours, untreated CSO volume, restricted and unrestricted shellfishing, nutrient and solids loads are derived based on a 1-year storm event.
- The bacteria standards applied are for fecal coliform, as follows: boating, 1000/100ml; swimming 200/100ml; unrestricted shellfishing 88/100ml.
- The duration of the simulation period was 99.4 hours.
- Nutrient load is from stormwater and CSO; solids load is from stormwater, CSO, and upstream boundary, if applicable.
- The number of untreated overflows per year is based on expected performance in a typical rainfall year.
- The closure of CSOs represents the number of CSO outfalls that could be permanently closed.

CSO Relocation to Reserved Channel. This alternative is the recommended plan. A consolidation conduit would be constructed to pick up outfalls BOS087 through BOS081 and convey all overflows to a screening, disinfection and dechlorination facility in the vicinity of outfall BOS080. This facility would discharge treated overflows to the Reserved Channel. All outfalls to Northern Dorchester Bay would be bulkheaded.

Sewer Separation. This alternative would involve separation of combined areas tributary to the South Boston Interceptor (SBI) South Branch and Main Branch, as well as a portion of the Dorchester Interceptor. Complete separation may be difficult in this area due to the potential for older houses having roof leaders connected to sanitary drainage within the internal house plumbing.

Consolidation/Storage Conduit (1-Year Storm Control). A consolidation conduit running along the shore of North Dorchester Bay, picking up outfalls BOS081 to BOS087, would have sufficient volume to capture the one-year storm overflow volume from those outfalls. This consolidation conduit would have a pump-out station in the vicinity of BOS087, to return the contents of the conduit to the Columbus Park Connection following the end of the storm.

Interceptor Relief and System Optimization at BOS081, BOS082 (1-Year Storm Control.) This alternative would involve providing relief of the SBI South Branch, and further system optimization at outfalls BOS081 and BOS082. Relief of the SBI South Branch, which may involve a combination of replacement of existing sections and installation of parallel relief pipe for other sections, is predicted to eliminate overflows at outfalls BOS083 to BOS087 for the one-year storm. It is expected that relatively minor overflows remaining at BOS081 and BOS082 during the one-year storm would be controlled by further system optimization, such as weir adjustments.

Consolidation/Storage Conduit (3-Month Storm Control). This alternative would be similar to the consolidation/storage conduit for one-year storm control, except that the conduit would not extend to outfall BOS087, which is not active during the 3-month storm.

SOUTH DORCHESTER BAY

Description of the Receiving Water Segment

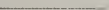




The South Dorchester Bay receiving water segment extends from Columbia Point to the Port Norfolk Yacht Club in Dorchester, and offshore to Thompson's Island and Squantum (Figure 3-3). South Dorchester Bay includes a portion of the Neponset River mouth, specifically Commercial Point and Tenean Beach. This area is classified as SB-Fishable/Swimmable with restricted shellfishing. The Squantum section of Quincy has restricted shellfish beds; however, several dozen shellfish beds in this area are classified as prohibited. Massachusetts DEP-designated critical uses in this receiving water segment include swimming and shellfishing. Water-based uses in this segment include swimming, boating, and fishing. This area contains Malibu Beach and Savin Hill Beach in Dorchester, and the city of Quincy maintains additional public beaches.

In addition to water-based recreational facilities, other public facilities in this area include parks, and the UMass/Boston campus, John F. Kennedy Library, and State Archives, located at Columbia Point, on the border with the North Dorchester Bay receiving water segment. This area includes high density residential housing, and industrial and commercial operations. The narrow sandy coastline in this area generally is bordered by roadways and some parkland. The Southeast Expressway runs through this area, with industrial and commercial activities adjacent to it.

The two CSO treatment facilities located at Fox Point and Commercial Point in South Dorchester Bay discharge treated combined sewage. The only source of untreated CSO is a bypass outfall for the Fox Point CSO treatment facility. Figure 3-2 presents the total



LEGEND

-  Existing Conduit
-  Pump Station
-  CSO Treatment Facility
-  Headworks
-  CSO Outfall

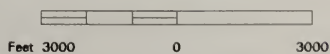


Figure 3-3
South Dorchester Bay
Neponset River

pollutant load and relative contributions to the load from CSO and stormwater for pollutants causing non-attainment of designated uses in South Dorchester Bay. Data for both the 1-year storm and for a typical year are presented. As shown in Figure 3-2, CSO discharges contribute only a minimal percentage of fecal coliform bacteria both annually and during a 1-year storm. This is a result of the generally effective disinfection of CSO flows provided by the Fox Point and Commercial Point facilities. Upstream flow from the Neponset River appears to be a major source of bacteria in South Dorchester Bay. For other parameters such as nutrients, BOD, and toxics, CSO discharges contribute a greater percentage of the loadings. Additional data on pollutant loads from CSO and stormwater sources are presented in Appendix A.

Description of CSO Alternatives

The CSO control alternatives evaluated in detail for this receiving water segment are summarized in Table 3-2, along with water quality benefits as compared with future planned conditions, critical siting issues, and costs. Brief descriptions of each alternative are provided below, and additional details on the recommended plan, upgrade the existing CSO facilities to dechlorination and complete sewer separation (phased), are provided in Section Four.

Upgrade the Existing CSO Facilities to Dechlorination and Complete Sewer Separation (phased). This alternative is the recommended plan. The existing Commercial Point and Fox Point CSO facilities would be upgraded with new dechlorination equipment to eliminate the potentially toxic chlorine residual. At the same time, a phased sewer separation program will be implemented, which will ultimately result in the separation of all combined areas tributary to the two CSO facilities, eliminating the CSO discharges. Once separation is completed, the two facilities could provide stormwater treatment by others.

Near Surface Storage at BOS090, Commercial Point CSO Facility, and BOS088/089, Fox Point CSO Facility (1-Year Storm Control). Storage tanks and facilities would be

TABLE 3-2. COMPARISON OF RECOMMENDED PLAN AND OTHER CONTROL ALTERNATIVES FOR SOUTH DORCHESTER BAY

Evaluation Criteria	Future Planned Conditions	Alternatives			
		Recommended Plan Sewer Separation and Upgrade Existing Facilities for Dechlorination	Storage Facilities at Both CSOs	Consolidation/ Storage of CSOs	Primary Treatment at Both CSOs
Water Quality Benefit (1)					
• Restricted Shellfishing (Bacteria Std. Exceedance, hrs.)	MB: 45.6 TB: 46.6 (2)	MB: 44.5 TB: 44.5	-	-	MB: 44.5 TB: 44.5
• Boating (Bacteria Std. Exceedance, hrs.)	MB: 15.5 TB: 16.6	MB: 8.3 TB: 15.5	-	-	MB: 7.2 TB: 15.5
• Swimming (Bacteria Std. Exceedance, hrs.)	MB: 35.2 TB: 38.3	MB: 33.1 TB: 34.1	-	-	MB: 33.1 TB: 34.1
• Aesthetics (Untreated CSO vol., MG)	0	0	0	0	0
• Aquatic Life (Sediment, lbs.)	23,100	9,900	3,600	3,600	13,300
• Performance (Untreated Overflows, no./yr.) (Closure of CSOs)	0 0	0 3	0 1	0 1	0 1
Critical Siting Concerns		Local Street Closing During Construction	Traffic/Truck access to school Rodent Control	Traffic, Residential Area, school Rodent Control	Traffic/Truck access to school Rodent Control
Capital Cost (millions)		\$95.4	\$89.6	\$99.5	\$25.4
Annual O & M Cost		\$22,000	\$1,435,200	\$1,424,160	\$1,780,752

- The following notes apply to the measures of water quality benefit:
 - Bacteria standard exceedance hours, untreated CSO volume, restricted shellfishing and solids loads are derived based on a 1-year storm event.
 - The bacteria standards applied are for fecal coliform, as follows: boating, 1000/100ml; swimming 200/100ml, restricted shellfishing 88/100ml.
 - The duration of the simulation period was 99.4 hours.
 - Nutrient load is from stormwater and CSO; solids load is from stormwater, CSO, and upstream boundary, if applicable.
 - The number of untreated overflows per year is based on expected performance in a typical rainfall year.
 - The closure of CSOs represents the number of CSO outfalls that could be permanently closed.
- Sampling locations at Malibu Beach (MB) and Tenean Beach (TB).

TABLE 3-2(con't). COMPARISON OF RECOMMENDED PLAN AND OTHER
CONTROL ALTERNATIVES FOR SOUTH DORCHESTER BAY

Evaluation Criteria	3 Month Storage Facilities at Both CSOs	3 Month Consolidation/ Storage of CSOs	3 Month Primary Treatment at Both CSOs
Water Quality Benefit (1)			
• Restricted Shellfishing (Bacteria Std. Exceedance, hrs.)	-	-	-
• Boating (Bacteria Std. Exceedance, hrs.)	-	-	-
• Swimming (Bacteria Std. Exceedance, hrs.)	-	-	-
• Aesthetics (Untreated CSO vol., MG)	0	0	0
• Aquatic Life (Sediment, lbs.)	17,590	17,590	19,950
• Performance (Untreated Overflows, no./yr.) (Closure of CSOs)	0 1	0 1	0 1
Critical Siting Concerns	Traffic/Truck access to school Rodent Control	Traffic, Residential Area, school Rodent Control	Traffic/Truck access to school Rodent Control
Capital Cost (millions)	\$39.0	\$47.7	\$17.8
Annual O & M Cost	\$1,214,400	\$1,202,256	\$1,502,544

1. The following notes apply to the measures of water quality benefit:

- Bacteria standard exceedance hours, untreated CSO volume, restricted shellfishing and solids loads are derived based on a 1-year storm event.
- The bacteria standards applied are for fecal coliform, as follows: boating, 1000/100ml; swimming 200/100ml; restricted shellfishing 88/100ml.
- The duration of the simulation period was 99.4 hours.
- Nutrient load is from stormwater and CSO; solids load is from stormwater, CSO, and upstream boundary, if applicable.
- The number of untreated overflows per year is based on expected performance in a typical rainfall year.
- The closure of CSOs represents the number of CSO outfalls that could be permanently closed.

constructed at or near the existing CSO facilities with sufficient volume to capture one-year storm overflows. These new storage tanks would be dewatered, following the end of the storm, to the Dorchester Interceptor. This alternative was eliminated from consideration due to insufficient space for a one-year storage tank at Fox Point and construction difficulties in expanding Commercial Point.

Primary Treatment at BOS090 and BOS088/089 (1-Year Storm Control). The existing CSO facilities would be upgraded with sedimentation tanks and dechlorination equipment. Whether the existing screening and disinfection facilities could be reused, or if the existing facilities would be abandoned or demolished, and new equipment incorporated into the new sedimentation facilities, would be evaluated during later planning and design phases. The upgraded facility would have sufficient capacity to provide the equivalent of primary treatment for one-year storm overflow volumes. Treated overflows would be discharged to South Dorchester Bay. Overflows from some storms smaller than the one-year storm may be entirely captured in the tanks and returned to the Dorchester Interceptor after the storm is over.

Consolidated Near Surface Storage, Near Fox Point (1-Year Storm Control). A consolidation conduit would convey flow from upstream of the Commercial Point CSO facility to a new storage tank near Fox Point. Flows tributary to Fox Point would also be diverted to this tank. The combination of the tank and the consolidation conduit would have sufficient capacity to capture the one-year storm overflow volume from these outfalls. The contents of the tank and the conduit would be returned to the Dorchester Interceptor following the end of the storm. This alternative was also eliminated from consideration due to insufficient space at Fox Point.

Near Surface Storage at BOS090 and BOS088/089 (3-Month Storm Control). This alternative is similar to the individual near surface storage facilities sized for the one-year storm described above, except that the facilities would be sized to capture the overflow

volume from the three-month storm at each location. It appears that the smaller tank could be sited at Fox Point.

Consolidated Near Surface Storage, Near Fox Point (3-Month Control). This alternative is similar to the consolidated near surface storage alternative described above, except that the facilities would capture the three-month storm overflow volume.

Primary Treatment at BOS090 and BOS088/089 (3-Month Storm Control). This alternative is similar to the individual primary treatment facilities described above, except that the facilities would provide primary treatment for up to the three-month storm. Flows greater than the three-month storm would pass through the facilities receiving a reduced level of treatment.

NEPONSET RIVER

Description of the Receiving Water Segment

The Neponset River, which flows from the Neponset Reservoir in Foxboro, drains into Dorchester Bay southwest of Boston. The receiving water segment is defined as that portion of the river which is impacted by CSOs and includes the area downstream of Mattapan Square in Boston to the mouth of the river down to the Port Norfolk Yacht Club in Dorchester (Figure 3-3). This segment is classified as SB-Fishable/Swimmable with restricted shellfishing. The critical uses designated for the receiving water segment are swimming and shellfishing. Existing water-based uses are confined to boating. The last four miles of the Neponset River, below Milton Lower Mills Dam, are tidal. Shellfish beds along this portion of the river have been identified, but harvesting currently is prohibited.

Land uses along the lower portion of the Neponset River consist of residential and urban areas, with some protected public open spaces, including the Neponset Marshes and the Blue

Hills Reservation. Near the mouth of the river, land has been designated by the MDC for future park development.

Two untreated CSOs discharge to the Neponset River, but stormwater and upstream river flow are the major sources of non-attainment of water quality standards. Figure 3-2 presents the total pollutant load and relative contributions to the load from CSO and stormwater for pollutants causing non-attainment of designated uses. As illustrated in Figure 3-2, although CSO discharges contribute a small percentage of fecal coliform bacteria during the 1-year storm, upstream flow contributes virtually all of the bacterial loading during a typical year, and bacterial counts in this upstream flow are high. Upstream flow also predominates in contributions of nutrients and toxics in this receiving water segment. Additional data on pollutant loads from CSO and stormwater sources are presented in Appendix A.

Description of CSO Alternatives

The CSO control alternatives evaluated in detail for this receiving water segment are summarized in Table 3-3, along with water quality benefits as compared with future planned conditions, critical siting issues, and costs. Brief descriptions of each alternative are provided below, and additional details on the recommended plan, complete sewer separation, are provided in Section Four.

Complete Sewer Separation. This alternative is the recommended plan. It would involve separation of all combined areas tributary to the Dorchester Interceptor in the vicinities of outfalls BOS093 and BOS095, eliminating these CSOs.

Consolidation Conduit with Near Surface Primary Treatment Near BOS093 (One-Year Storm Control). This alternative would involve constructing a consolidation conduit running along the shore of the Neponset River picking up outfalls BOS093 and BOS095. This conduit convey flow to a primary treatment facility in the vicinity of BOS093. Both conduit and facility would have sufficient capacity to capture and treat one-year storm overflow

TABLE 3-3. COMPARISON OF RECOMMENDED PLAN AND OTHER CONTROL ALTERNATIVES FOR NEPONSET RIVER

Evaluation Criteria	Future Planned Conditions	Alternatives			
		Recommended Plan Sewer Separation	Indiv. Near Surface Storage Tanks at BOS095 & 093 (1 yr)	Storage at BOS093, Primary Treat. at BOS095 (1 yr)	Consolidated Primary Treat. Near BOS093 (1 yr)
Water Quality Benefit (1)					
• Restricted Shellfishing (Bacteria Std. Exceedance, hrs.)	46.6	44.5	44.5	-	-
• Boating (Bacteria Std. Exceedance, hrs.)	16.6	15.5	15.5	-	-
• Swimming (Bacteria Std. Exceedance, hrs.)	38.3	34.1	34.1	-	-
• Aesthetics (Untreated CSO vol., MG)	2.77	0	0	1.88	1.05
• Aquatic Life (Sediment, lbs.)	3,230	0	0	1,320	736
• Performance (Untreated Overflows, no./yr.) (Closure of CSOs)	17 0	0 2	1-3 0	1-3(BOS093) 0	0-3 0-1
Critical Siting Concerns					
		Local street closings during construction	Parking, traffic impacts near BOS095	Parking, traffic impacts near BOS095	Elderly housing along cons. conduit
Capital Cost (millions)		10.7	17.8	10.4	18.8
Annual O & M Cost		0	347,000	405,000	125,000

1. The following notes apply to the measures of water quality benefit:

- Bacteria standard exceedance hours; untreated CSO volume, nutrient and solids loads are derived based on a 1-year storm event.
- The bacteria standards applied are for fecal coliform, as follows: boating, 1000/100ml; swimming 200/100ml; restricted shellfishing 88/100ml.
- The duration of the simulation period was 99.4 hours; sampling at Tenean Beach.
- Nutrient load is from stormwater and CSOs; solids load is from stormwater, CSO, and upstream boundary, if applicable.
- The number of untreated overflows per year is based on expected performance in a typical rainfall year.
- The closure of CSOs represents the number of CSO outfalls that could be permanently closed.

TABLE 3-3-(con't). COMPARISON OF RECOMMENDED PLAN AND OTHER
CONTROL ALTERNATIVES FOR NEPONSET RIVER

Evaluation Criteria	Indiv. Screen, Disinf., and Dechlor. at BOS093 & 095	Indiv. Storage Tanks at BOS093 & 095 (3 mo)	Coarse Screens at Outfalls
Water Quality Benefit (1)			
• Restricted Shellfishing (Bacteria Std. Exceedance, hrs.)	-	-	-
• Boating (Bacteria Std. Exceedance, hrs.)	-	-	-
• Swimming (Bacteria Std. Exceedance, hrs.)	-	-	-
• Aesthetics (Untreated CSO vol., MG)	2.77	2.44	2.77
• Aquatic Life (Sediment, lbs.)	3,070	2,710	3,070
• Performance (Untreated Overflows, no./yr.) (Closure of CSOs)	0 0	0 0	17 0
Critical Siting Concerns	Parking, traffic impacts at BOS095	Parking, traffic impacts at BOS095	
Capital Cost (millions) Annual O & M Cost	4.7 260,000	4.9 1,200,000	1.7 1,500,000

1. The following notes apply to the measures of water quality benefit:

- Bacteria standard exceedance hours, untreated CSO volume, nutrient and solids loads are derived based on a 1-year storm event.
- The bacteria standards applied are for fecal coliform, as follows: boating, 1000/100ml; swimming 200/100ml; restricted shellfishing 88/100ml.
- The duration of the simulation period was 99.4 hours; sampling at Tenean Beach.
- Nutrient load is from stormwater and CSO; solids load is from stormwater, CSO, and upstream boundary, if applicable.
- The number of untreated overflows per year is based on expected performance in a typical rainfall year.
- The closure of CSOs represents the number of CSO outfalls that could be permanently closed.

volumes from the two outfalls. Overflows from some smaller storms may be entirely captured within the volume of the conduit and facility, and returned by pumps to the Dorchester Interceptor following the storm.

Individual Screening, Disinfection, and Dechlorination Facilities at both BOS095 and BOS093 (One-Year Storm Control). One screening, disinfection and dechlorination facility would be constructed in the vicinity of outfall BOS095 and the other in the vicinity of BOS093. Both facilities would have the capacity to provide flow-through treatment of the one-year overflow volumes at these outfalls.

Individual Near Surface Storage at BOS095 and BOS093 (One-Year Storm Controls). This alternative would involve constructing two storage facilities, one in the vicinity of BOS095 and the other in the vicinity of BOS093. Each would have sufficient capacity to capture the one-year storm overflow volumes for these outfalls. Following the storm, the contents of the two facilities would be pumped to the Dorchester Interceptor.

Individual Near Surface Storage at BOS093 and Primary Treatment at BOS095 (One-Year Storm Controls). This alternative is similar to the individual near surface storage for one-year storm control, except a much smaller tank would be required at BOS095, to provide primary treatment for the peak flow from the one-year storm.

Individual Near Surface Storage at BOS095 and BOS093 (Three-Month Storm Controls). This alternative is similar to the individual near surface storage for one-year storm control, except the facilities would have a three-month storm overflow volume capacity.

Coarse Screening at BOS095 and BOS093. This alternative would involve constructing screening facilities in each outfall conduit. The screens would be manually cleaned, coarse bar screens which would be housed within a simple chamber. The screens would remove large objects from the overflows.

CONSTITUTION BEACH

Description of the Receiving Water Segment

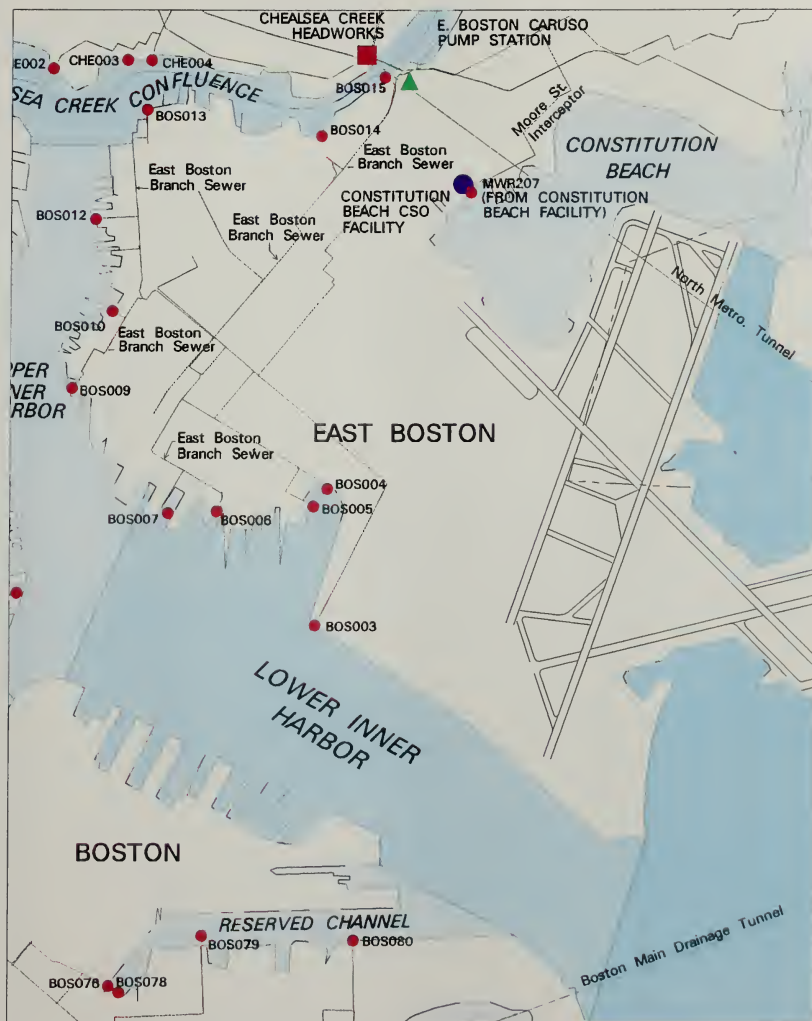
The Constitution Beach receiving water segment consists of the relatively isolated water body which lies between Logan Airport and the Orient Heights section of East Boston (Figure 3-4). This area is classified as SB-Fishable/Swimmable with restricted shellfishing. A large area north of the airport runways is currently designated for restricted shellfishing by commercial harvesters. Additional beds, designated as prohibited, lie along the northern part of the water. The designated critical uses for this area are swimming and shellfishing. Swimming at Constitution Beach is the main existing water-based use.

Multi- and single family housing and commercial activities surround the beach. Logan Airport and its entrances border the beach area. Marinas and yacht clubs are also located in the area.

The only CSO in the Constitution Beach receiving water segment is screened and disinfected at the Constitution Beach CSO facility. Figure 3-2 presents the total pollutant load and relative CSO and stormwater loads for pollutants causing non-attainment of designated uses in this segment. As indicated in Figure 3-2, fecal coliform bacteria is the only criterion that prevents the attainment of designated uses, but CSO discharges contribute only an insignificant amount of the fecal coliform load for the 1-year storm and annually. Stormwater is the predominant source of the total fecal coliform bacteria loads. Additional data on pollutant loads from CSO and stormwater sources are presented in Appendix A.

Description of CSO Alternatives

The CSO control alternatives evaluated in detail for this receiving water segment are summarized in Table 3-4, along with water quality benefits as compared with future planned conditions, critical siting issues, and costs. Brief descriptions of each alternative are provided



LEGEND



Existing Conduit



Pump Station



CSO Treatment Facility



Headworks

CSO Outfall



Feet 2500 0 2500

Figure 3-4

Constitution Beach

Lower Inner Harbor

**TABLE 3-4. COMPARISON OF RECOMMENDED PLAN AND OTHER
CONTROL ALTERNATIVES FOR CONSTITUTION BEACH**

Evaluation Criteria	Future Planned Conditions	Alternatives			3 Month Near Surface Storage
		Recommended Plan Complete Sewer Separation	Moore Street Interceptor Relief	Near Surface Storage	
Water Quality Benefit (1)					
• Unrestricted Shellfishing (Bacteria Std. Exceedance, hrs.)	BH2: 43.5 BHD: 60.0 BHC: 60.1 (2)	BH2: 42.5 BHD: 60.0 BHC: 59.9	BH2: 42.5 BHD: 60.0 BHC: 59.9	BH2: 42.5 BHD: 60.0 BHC: 59.9	-
• Restricted Shellfishing (Bacteria Std. Exceedance, hrs.)	BH2: 5.2 BHD: 38.3 BHC: 38.4	BH2: 5.2 BHD: 38.3 BHC: 38.2	BH2: 5.2 BHD: 38.3 BHC: 38.2	BH2: 5.2 BHD: 38.3 BHC: 38.2	-
• Boating (Bacteria Std. Exceedance, hrs.)	BH2: 0.0 BHD: 0.0 BHC: 2.1	BH2: 0.0 BHD: 0.0 BHC: 0.1	BH2: 0.0 BHD: 0.0 BHC: 0.1	BH2: 0.0 BHD: 0.0 BHC: 0.1	-
• Swimming (Bacteria Std. Exceedance, hrs.)	BH2: 0.0 BHD: 26.9 BHC: 28.0	BH2: 0.0 BHD: 27.9 BHC: 28.9	BH2: 0.0 BHD: 27.9 BHC: 28.9	BH2: 0.0 BHD: 27.9 BHC: 28.9	-
• Performance (Untreated Overflows, no./yr.) (Closure of CSOs)	16 0	0 1	1 - 3 0	1 - 3 0	4 - 8 0
Critical Siting Concerns		Local street closings during construction	Traffic impacts on local streets.	None	None
Capital Cost (millions)		8.7	7.0	5.7	2.0
Annual O & M Cost		0	0	46,000	19,000

1. The following notes apply to the measures of water quality benefit:

- Bacteria standard exceedance hours, untreated CSO volume, restricted and unrestricted shellfishing loads are derived based on a 1-year storm event.
- The bacteria standards applied are for fecal coliform, as follows: boating, 1000/100ml; swimming 200/100ml; unrestricted shellfishing 14/100 ml; restricted shellfishing 88/100 ml
- The duration of the simulation period was 99.4 hours.
- Nutrient load is from stormwater and CSO; solids load is from stormwater, CSO, and upstream boundary, if applicable.
- The number of untreated overflows per year is based on expected performance in a typical rainfall year.
- The closure of CSOs represents the number of CSO outfalls that could be permanently closed.
- Data locations along the east shore of Logan Airport (BH2), at Orient Heights Beach (BHD), and near outfall MWR 207 (BHC).

below, and additional details on the recommended plan, complete sewer separation, are presented in Section Four.

Complete Sewer Separation. This alternative is the recommended plan. It would involve separation of all combined areas tributary to CSO regulator RE002-2, eliminating the CSO.

Moore Street Interceptor Relief (One-Year Storm Control). Relief of the Moore Street Interceptor, which may involve a combination of replacement of existing sections and installation of parallel relief pipe for other sections, is predicted to eliminate overflows at MWR207 for the one-year storm.

Near Surface Storage (One-Year Storm Control). This alternative would involve upgrading the existing Constitution Beach Facility with a storage tank with sufficient capacity to capture overflow volume from the one-year storm. Following the storm, the contents of the tank would be returned to the interceptor.

Near Surface Storage (Three-Month Storm Control). This alternative is similar to near surface storage with one-year control, except that the tank would have a three-month storm capacity.






UPPER CHARLES RIVER

Description of the Receiving Water Segment

The Upper Charles River segment extends from the Watertown Dam to the Cottage Farm CSO facility near the B.U. Bridge (Figure 3-5). The river is bounded on the north by Watertown and Cambridge, and on the south by Newton and Boston. The Upper Charles segment of the river is classified as Class B-Fishable/Swimmable and other compatible uses. There are no Massachusetts DEP-designated critical uses for this receiving water segment. The dominant water-based recreational uses in the Upper Charles River are canoeing,



LEGEND

-  Existing Conduit
-  Pump Station
-  CSO Treatment Facility
-  Headworks
-  CSO Outfall

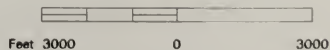


Figure 3-5
Upper Charles

rowing, sailboating, and powerboating. There are three public boat landings, as well as private boating facilities and collegiate crew boathouses along the banks of the river.

The land along the Upper Charles River segment is heavily developed and used for nearshore recreation (the Charles River Reservation) including playgrounds, skating rinks, recreation centers, and pools. This area is bordered by major roads, including Soldiers Field Road, Storrow Drive and Memorial Drive. Parkland and/or developed walkways provide linkages along much of the river; the bicycle path along either side of the river is used by pedestrians as well as cyclists. Magazine Beach near the B.U. Bridge was historically used for swimming; an MDC pool is now operated in this area. Away from the river's edge, land uses are mainly urban residential. Near the mouth, there is the intensive commercial land use of downtown Boston and East Cambridge.

A total of six untreated CSOs discharge to the Upper Charles receiving water segment. Figure 3-2 presents the total pollutants load and relative contributions to the load from CSO and stormwater for pollutants causing non-attainment of designated uses in this segment. As shown in Figure 3-2, stormwater and upstream flow are the predominant sources of fecal coliform bacteria for the 1-year storm and the typical year. Annually, upstream flow is the overwhelming contributor of bacteria loads, nutrients, and toxics; whereas stormwater is the largest contributor of these pollutants for the 1-year storm. Additional data on pollutant loads from CSO and stormwater sources are presented in Appendix A.

Description of CSO Alternatives

The CSO control alternatives evaluated in detail for this receiving water segment are summarized in Table 3-5, along with water quality benefits as compared with future planned conditions, critical siting issues, and costs. Brief descriptions of each alternative are provided below, and additional details on the recommended plan, screening, disinfection, and dechlorination at CAM005, CAM009 and BOS032, are provided in Section Four.

TABLE 3-5. COMPARISON OF RECOMMENDED PLAN AND OTHER CONTROL ALTERNATIVES FOR UPPER CHARLES RIVER

Evaluation Criteria	Future Planned Conditions	Alternatives				
		Recommended Plan Screening and Disinfection at Individual CSOs	Complete Sewer Separation	Partial Sewer Separation	Storage Facilities at Individual CSOs	Coarse Screening at Individual CSOs
Water Quality Benefit (1)						
• Boating (Bacteria Std. Exceedance, hrs.)	72.4	72.4	72.4	72.4	73.5	72.4
• Swimming (Bacteria Std. Exceedance, hrs.)	99.3	99.3	99.3	99.3	99.4	99.3
• Aesthetics (Untreated CSO vol., MG)	1.67	0	0	0	0	1.67
• Aquatic Life (Nutrient (TP) Load, lbs.)	796	796	990	908	753	796
(Solids Load, lbs.)	89,400	89,400	108,200	101,000	87,450	89,400
• Performance (Untreated Overflows, no./yr.)	12	0	0	1-3	1-3	12
(Closure of CSOs)	-	0	6	0-3	0	0
Critical Siting Concerns		None	Local Street Closings During Construction	Local Street Closings During Construction	Tight Sensitive Site for Storage Facility	
Capital Cost (millions)		\$5.1	\$87.2	\$27.5	\$11.8	\$1.0
Annual O & M Cost		\$140,000	\$0	\$0	\$100,000	\$33,000

1. The following notes apply to the measures of water quality benefit:
- Bacteria standard exceedance hours, untreated CSO volume, nutrient and solids loads are derived based on a 1-year storm event.
 - The bacteria standards applied are for fecal coliform, as follows: boating, 1000/100ml; swimming 200/100ml.
 - The duration of the simulation period was 99.4 hours.
 - Nutrient load is from stormwater and CSO; solids load is from stormwater, CSO, and upstream boundary, if applicable.
 - The number of untreated overflows per year is based on expected performance in a typical rainfall year.
 - The closure of CSOs represents the number of CSO outfalls that could be permanently closed.

Individual Screening, Disinfection and Dechlorination Facilities at Outfalls CAM005, CAM009, and BOS032. This alternative is the recommended plan. A separate screening, disinfection, and dechlorination flow-through treatment facility would be constructed for each of the three outfalls. These facilities would discharge treated overflows to the Charles River.

Sewer Separation. This alternative would involve separation of combined areas upstream of regulators tributary to the North Charles Metropolitan Sewer, the North Charles Relief Sewer, the Charles River Valley Sewer, and the South Charles Relief Sewer, west of the Cottage Farm CSO facility.

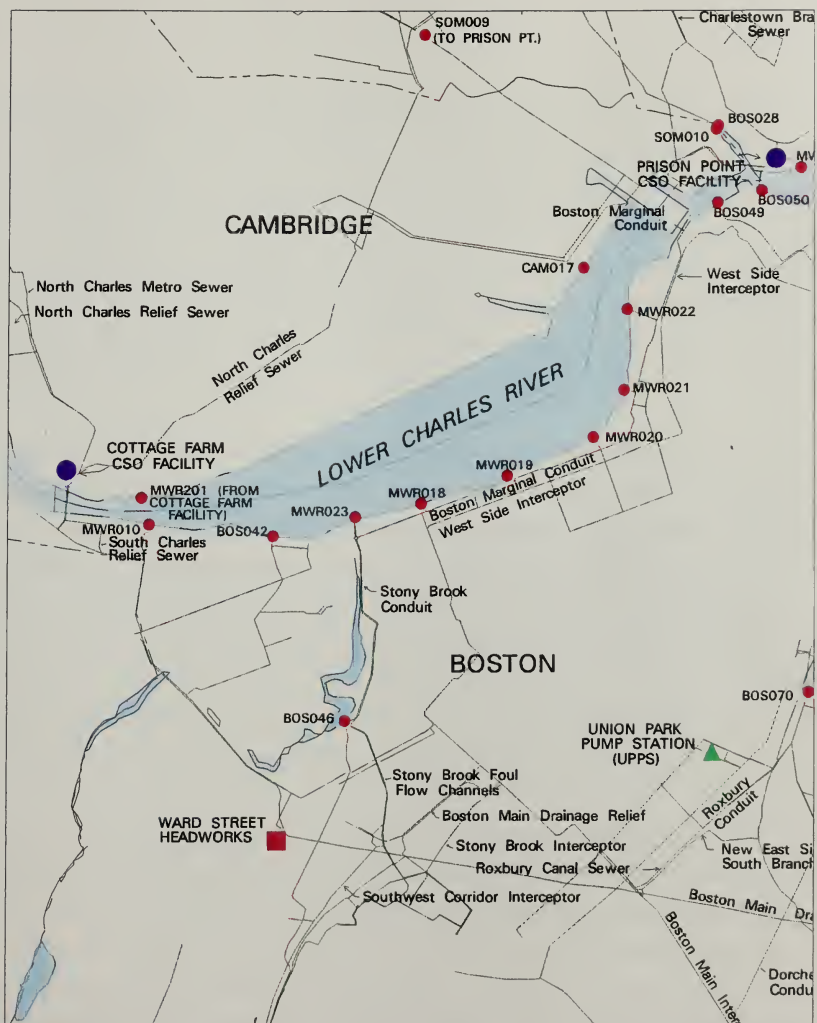
Storage at CAM005, CAM009, and Enlarging the Interceptor Connection at BOS032 (One-Year Storm Controls). This alternative would involve constructing storage facilities in the vicinity of CAM005 and CAM009 with sufficient capacity to capture the overflow volumes for the one-year design storm at the outfalls. Following the storm, the storage facilities would be dewatered by pumping the contents of the tanks back to the North Charles Metropolitan Sewer. Also, this alternative would involve increasing the pipe size between CSO regulator RE032-1 and the Charles River Valley Sewer. This increase is predicted to eliminate overflows at outfall BOS032 for the one-year storm.

Coarse Screening at Outfalls CAM005, CAM009, and BOS032. This alternative would involve constructing manually cleaned bar screens in the outfall conduits for outfalls CAM005, CAM009, and BOS032. These coarse screens would remove large objects from the overflows before being discharged to the Charles River.






LOWER CHARLES RIVER

Description of the Receiving Water Segment

The Lower Charles River receiving water segment extends from the Cottage Farm CSO facility to the new Charles River Dam and Locks (Figure 3-6). This stretch of the river is



LEGEND

-  Existing Conduit
-  Pump Station
-  CSO Treatment Facility
-  Headworks
-  CSO Outfall

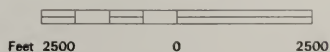


Figure 3-6
Lower Charles
Back Bay Fens

bounded on the north by Cambridge and Charlestown, and on the south by Boston. The Lower Charles River segment is classified as a Class B-Fishable/Swimmable and other compatible uses. There are no Massachusetts DEP-designated critical uses for this segment. The predominant water-based recreational use of the Lower Charles River is boating, including powerboating, sailboating, and rowing, although windsurfing is also common. The Community Boating program which provides sailing instruction and rental opportunities to the public operates along this section of the river. There are two powerboat marinas on the Cambridge side of the river.

The Lechmere Canal enters the Charles River just above the old dam. The canal is surrounded by an upscale shopping mall and residences, and is used for paddle boating and by river sightseeing tour boats. The Miller's River enters between the two dams. The area around the Miller's River is used for industry and transportation (elevated highways, railroads). The Charles River Reservation is prominent along this river section and is heavily used by the public for passive recreation and use of MDC recreational facilities. Paths along the banks of the Lower Charles River are heavily used by pedestrians as well as cyclists. The Hatch Shell is a major focal point for public activities during the summer. Beyond the river's edge, land uses are dense urban residential and commercial.

There are 13 CSO outfalls located in the Lower Charles River receiving water segment, including the Cottage Farm CSO facility (MWR201) which is the only treated discharge. With the exception of MWR201 and Stony Brook (MWR023), CSOs in this segment occur only rarely after large storm events. Most of the untreated combined sewage entering the Lower Charles River is discharged via Stony Brook. As discussed in Section Three of Volume I, CSO discharge volumes to the Charles River from the Cottage Farm CSO facility, which provides screening and disinfection, and 1.2 million gallons of storage/detention treatment, have been dramatically reduced due to system improvements.

Figure 3-2 presents the total pollutant load and relative contributions from CSO and stormwater for pollutants causing non-attainment of designated uses in the Lower Charles

River receiving water segment. As indicated in Figure 3-2, a significant percentage of the pollutant loads to this segment are contributed by upstream flow, especially on an annual basis. CSO discharges do contribute a large portion of the fecal coliform bacteria load and nutrient load for the 1-year storm. For the other parameters, stormwater and upstream flow are the predominant sources. Additional data on pollutant loads from CSO and stormwater sources are presented in Appendix A.

Description of CSO Alternatives

The CSO control alternatives evaluated in detail for this receiving water segment are summarized in Table 3-6, along with water quality benefits as compared with future planned conditions, critical siting issues, and costs. Brief descriptions of each alternative are provided below, and additional details on the recommended plan, screening, disinfection and dechlorination of the Stony Brook Conduit at outfall MWR023 and improvement to the Cottage Farm CSO Facility, are presented in Section Four.

Screening, Disinfection and Dechlorination for the Stony Brook Conduit and Improvement to the Cottage Farm CSO Facility. This alternative is the recommended plan. A flow through screening, disinfection and dechlorination facility would be constructed in the vicinity of MWR023 to treat Stony Brook Conduit flow, including CSOs, prior to being discharged to the Charles River. Also, the existing Cottage Farm CSO Facility would be upgraded to include dechlorination equipment, new effluent screens, and a new outfall diffuser.

Sewer Separation. This alternative would involve separation of all combined areas tributary to the Ward Street Headworks east of the Cottage Farm CSO Facility. Complete separation of this area would be difficult, since much of it is a highly developed urban area.

Stony Brook Consolidation to Storage and Cottage Farm Storage (One-Year Storm Control). This alternative would involve the construction of a consolidation conduit running

**TABLE 3-6. COMPARISON OF RECOMMENDED PLAN AND OTHER
CONTROL ALTERNATIVES FOR LOWER CHARLES RIVER**

Evaluation Criteria	Future Planned Conditions	Alternatives		
		Recommended Plan Stony Brook Screen/Disinfect, of SB Conduit; Cottage Farm Detention/Disinfect.	Complete Sewer Separation	Stony Brook Consolid. to Storage; Cottage Farm Storage (1 yr)
Water Quality Benefit (1)				
• Boating (Bacteria Std. Exceedance, hrs.)	(2) BU: 83.8 CBH: 80.7	BU: 78.7 CBH: 39.3	BU: 83.8 CBH: 58.0	BU: 78.7 CBH: 37.3
• Swimming (Bacteria Std. Exceedance, hrs.)	BU: 99.3 CBH: 99.3	BU: 99.4 CBH: 99.3	BU: 99.3 CBH: 99.4	BU: 99.4 CBH: 99.4
• Aesthetics (Untreated CSO vol., MG)	13.33	46.06	0	0
• Aquatic Life (Nutrient (TP) Load, lbs.) (Solids Load, lbs.)	1,592 140,000	1,592 137,310	732 115,100	398 86,200
• Performance (Untreated Overflows, no./yr.) (Closure of CSOs)	30 0	0 2 - 7 (h)	0 9 (g)	1 - 3 2 - 7 (h)
Critical Siting Concerns		Mass. Historical Commission issues regarding utilization of Charlegate Gatehouse	Local street closings during construction; extensive area to be separated	SB: Conduit impacts schools, housing, parks and residences CF: Impacts ballfield use
Capital Cost (millions)		\$26	\$485	\$249
Annual O & M Cost		\$1,100,000	\$0	\$1,550,000

1. The following notes apply to the measures of water quality benefit:

- Bacteria standard exceedance hours, untreated CSO volume, nutrient and solids loads are derived based on a 1-year storm event.
 - The bacteria standards applied are for fecal coliform, as follows: boating, 1000/100ml; swimming 200/100ml.
 - The duration of the simulation period was 99.4 hours.
 - Nutrient load is from stormwater and CSO; solids load is from stormwater, CSO, and upstream boundary, if applicable.
 - The number of untreated overflows per year is based on expected performance in a typical rainfall year.
 - The closure of CSOs represents the number of CSO outfalls that could be permanently closed.
 - CSOs BOS028, BOS049 and CAM017 provide relief for Prison Point, and may not be closed as a result of separation of areas tributary to Stony Brook and Cottage Farm.
 - CSOs BOS042 and MWR010 can be closed based on SOP Report findings. From 0 to 5 of outfalls MWR018 and MWR022 may be closed.
2. Data locations at Boston University Sailing (BU) and Community Boat House (CBH).

TABLE 3-6 (con't). COMPARISON OF RECOMMENDED PLAN AND OTHER CONTROL ALTERNATIVES FOR LOWER CHARLES

Evaluation Criteria	Alternatives		
	Stony Brk Consolid. to Storage w/ Diversion at RE046-381; Cottage Farm Storage (3 mo)	Stony Brk Consolid. to Screen/ Disinfection; Cottage Farm detention/disinfect. (3 mo)	Stony Brk Conduit Swirl, Foul Flow pump to HLS Cottage Farm detent./disinfect.
Water Quality Benefit (1)			
• Boating (Bacteria Std. Exceedance, hrs.)	-	-	-
• Swimming (Bacteria Std. Exceedance, hrs.)	-	-	-
• Aesthetics (Untreated CSO vol., MG)	32.76	41.76	43.10
• Aquatic Life (Nutrient (TP) Load, lbs.) (Solids Load, lbs.)	1,242 122,600	1,481 132,540	1,433 132,300
• Performance (Untreated Overflows, no./yr.) (Closure of CSOs)	CF: 0 SB: 4 - 7 2 - 7 (h)	0 2 - 7 (h)	0 2 - 7 (h)
Critical Siting Concerns	SB: Conduit impacts schools, elderly housing, parks and residences CF: Facility located under active ballfield	SB: Conduit impacts schools, elderly housing, parks and residences CF: Storage Facility would temporarily impact ballfield	SB: Large site required for swirl concentrators not available
Capital Cost (millions)	\$98	\$74	\$68
Annual O & M Cost	\$1,100,000	\$880,000	\$1,700,000

1. The following notes apply to the measures of water quality benefit:

- Bacteria standard exceedance hours, untreated CSO volume, nutrient and solids loads are derived based on a 1-year storm event.
 - The bacteria standards applied are for fecal coliform, as follows: boating, 1000/100ml; swimming 200/100ml.
 - The duration of the simulation period was 99.4 hours.
 - Nutrient load is from stormwater and CSO; solids load is from stormwater, CSO, and upstream boundary, if applicable.
 - The number of untreated overflows per year is based on expected performance in a typical rainfall year.
 - The closure of CSOs represents the number of CSO outfalls that could be permanently closed.
 - CSOs BOS028, BOS049 and CAM017 provide relief for Prison Point, and may not be closed as a result of separation of areas tributary to Stony Brook and Cottage Farm.
 - CSOs BOS042 and MWR010 can be closed based on SOP Report findings. From 0 to 5 of outfalls MWR018 and MWR022 may be closed.
2. Data locations at Boston University Sailing (BU) and Community Boat House (CBH).

along the Stony Brook Conduit (SBC), which would pick up overflows from the multiple regulators tributary to the SBC. The conduit would convey flows to a storage tank in the vicinity of the Ward Street Headworks which, combined with the consolidation conduit, would have sufficient capacity to capture all overflow volumes for the one-year storm. At the Cottage Farm Facility additional storage tanks would be constructed to allow capture of the overflow volume for the one-year storm. Following the storm, both the Stony Brook and Cottage Farm Facilities would be dewatered back to MWRA Interceptors.

Stony Brook Consolidation to Storage with Diversion at CSO Regulator RE046-381; Storage at Cottage Farm (Three-Month Storm Control). This alternative is similar to Stony Brook consolidation to storage and Cottage Farm storage with one-year storm control, except that in the Stony Brook system, a flow diversion would be constructed at RE046-381 on the Southwest Corridor Interceptor, which would reduce the required length of the consolidation conduit. The flow diversion structure would have the capability of completely diverting the three-month storm overflow volume from RE046-381 to the Stony Brook Valley Sewer. The storage facilities at Ward Street and Cottage Farm would be sized to capture the three-month storm.

Stony Brook Consolidation to Screening, Disinfection and Dechlorination Facility and Less Than Primary Treatment at Cottage Farm. This alternative is similar to the alternative described above for the Stony Brook System except that a flow through treatment facility would be constructed in the vicinity of Ward Street Headworks, instead of a storage tank. This facility would provide screening, disinfection, and dechlorination for the overflow volume captured by the consolidation conduit. No change to the tank capacity would be provided at the Cottage Farm facility, although dechlorination equipment would be added.

BACK BAY FENS

Description of the Receiving Water Segment

The Back Bay Fens receiving water segment comprises the farthest downstream section of the Muddy River; however, most of the Muddy River flow is diverted around the Fens through the Muddy River Conduit directly to the Charles River (Figure 3-6). The Stony Brook conduit is a source of pollutants to the Fens and the Charles River. The Back Bay Fens receiving water segment is classified as Class B-Fishable/Swimmable and other compatible uses. There are no Massachusetts DEP-designated critical uses for this receiving water segment and no existing water-based uses.

The Back Bay Fens receiving water segment includes a portion of the Olmstead Park System, a National Historic Register District, consisting of a series of parks linked by continuous parkways curving south from the mouth of the Muddy River to Franklin Park. Beyond the banks of the Fens the area consists of dense residential and commercial land uses.

The Boston Gatehouse 1 (BOS046) is the overflow for the Stony Brook conduit and the only untreated CSO discharge to the Back Bay Fens receiving water segment. This overflow is relatively inactive, discharging only during storms on the order of the one-year storm or greater. Figure 3-2 presents the total pollutant load and relative contributions from CSO and stormwater for pollutants causing non-attainment of designated uses for this segment. No significant upstream or boundary sources were identified for the Back Bay Fens. As shown in Figure 3-2, CSO discharges contribute a large percentage of fecal coliform bacteria loads for the 1-year storm, but stormwater has a greater impact on an annual basis. For parameters other than fecal coliform bacteria, the loads from stormwater are substantially greater than the loads from CSOs. Additional data on pollutant loads from CSO and stormwater sources are presented in Appendix A.

Description of CSO Alternatives

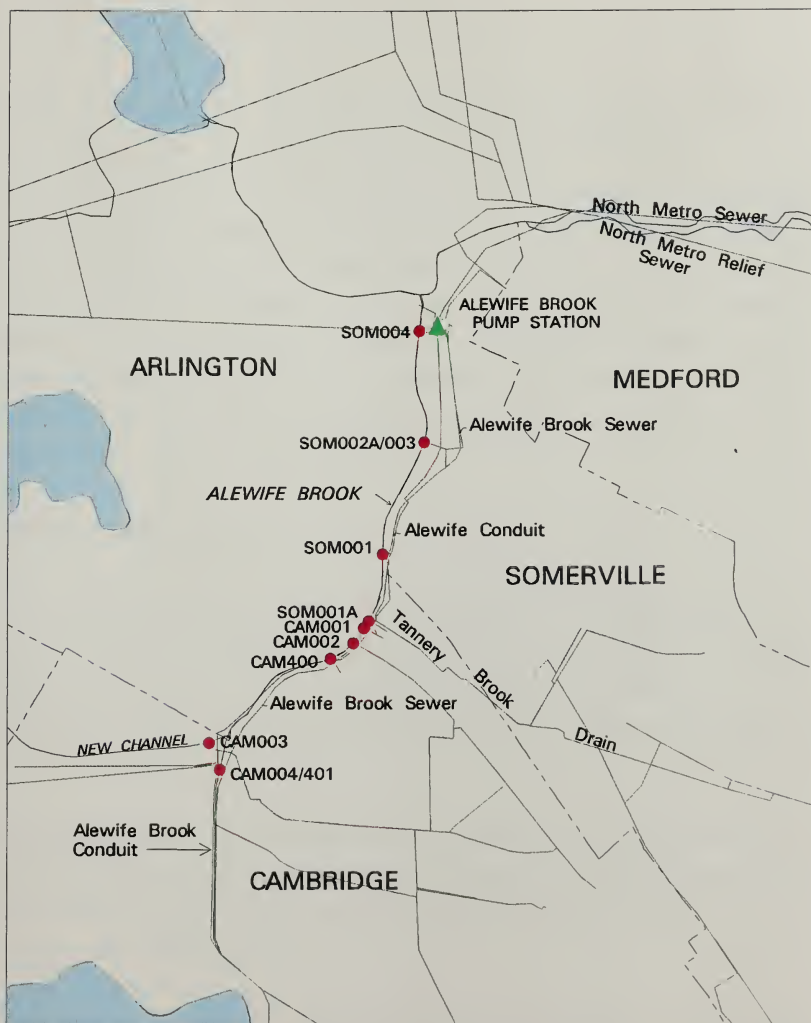
The recommended plan is to install manually-cleaned bar screens at BOS046. This equipment would be installed either within Gatehouse No. 1, or on the outfall adjacent to the gatehouse. Additional details on the recommended plan are presented in Section Four. Other alternatives were evaluated for this receiving water as part of alternatives for the Stony Brook system in the Lower Charles (consolidation of Stony Brook flows eliminated overflows at BOS046).

ALEWIFE BROOK






Description of the Receiving Water Segment

Alewife Brook is a narrow, slow-moving waterbody that flows from the Little River in Belmont to the Mystic River in Arlington/Medford (Figure 3-7). The Alewife Brook receiving water segment is classified as a Class B-Fishable/Swimmable waterbody. There are no Massachusetts DEP-designated critical uses for this receiving water segment. Existing water-based uses of Alewife Brook include fishing and canoeing, although the latter is somewhat restricted. The brook is a critical part of the annual alewife migration to upstream spawning areas.

Much of the land along the Alewife Brook is owned by the Metropolitan District Commission (MDC) as part of the Alewife Brook Reservation. However, this is a heavily developed urban area with major roads crossing the brook, and residential, commercial and office developments abutting the MDC properties. Current park uses adjacent to the Alewife Brook include pools, playgrounds and playing fields. Alewife Brook Pump Station, which pumps sewage from portions of Somerville, Cambridge, Belmont, Arlington, Lexington and Medford to the North Metropolitan Relief Sewer in Medford, also abuts the brook.



LEGEND

-  Existing Conduit
-  Pump Station
-  CSO Treatment Facility
-  Headworks
-  CSO Outfall

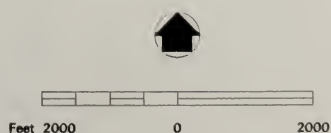


Figure 3-7
Alewife

A total of 11 CSO outfalls potentially discharge untreated overflows to the Alewife Brook receiving water segment. At two of these outfall locations, CAM004/401 and SOM002A/003, two separate CSOs (i.e., CAM004 and CAM401) essentially discharge at the same outfall. Figure 3-2 presents the total pollutant load and relative contributions to the load from CSO and stormwater for pollutants causing non-attainment of designated uses in this segment. As indicated in Figure 3-2, CSOs are a predominant source of fecal coliform bacteria for the 1-year storm, while stormwater has a greater impact on an annual basis. For parameters other than fecal coliform bacteria, the loads from stormwater are substantially greater than the loads from CSOs. Additional data on pollutant loads from CSO and stormwater sources are presented in Appendix A.

Description of CSO Alternatives

The CSO control alternatives evaluated in detail for this receiving water segment are summarized in Table 3-7, along with water quality benefits as compared with future planned conditions, critical siting issues, and costs. Brief descriptions of each alternative are presented below, and additional details on the recommended plan, separation of CAM004, are presented in Section Four.

Separation of CAM004. This alternative is the recommended plan. The combined areas tributary to CAM004 would be separated, and separate storm drains tributary to RE041 would be routed around the regulator. This alternative would provide control of approximately the three month storm.

Complete Sewer Separation. This alternative would involve separation of combined areas tributary to the Alewife Brook Sewer and the Alewife Brook Conduit.

Consolidation to Near Surface Storage Facility (One-Year Storm Controls). This alternative would involve constructing a consolidation conduit running parallel to Alewife Brook, picking up outfalls CAM004 to SOM004. This conduit would convey overflows to a

**TABLE 3-7. COMPARISON OF RECOMMENDED PLAN AND OTHER
CONTROL ALTERNATIVES FOR ALEWIFE BROOK**

Evaluation Criteria	Future Planned Conditions	Alternatives			
		Recommended Plan Separation at CAM004 (3 mo)	Complete Sewer Separation	Consolidated Near Surface Storage Facility (1 yr)	Consolidation/Storage Conduit (1 yr)
Water Quality Benefit (1)					
• Boating (Bacteria Std. Exceedance, hrs.)	-	-	-	-	-
• Swimming (Bacteria Std. Exceedance, hrs.)	-	-	-	-	-
• Aesthetics (Untreated CSO vol., MG)	5.1	2.7	0	0	0
• Aquatic Life (Nutrient (TP) Load, lbs.) (Solids Load, lbs.)	372 27,000	391 25,760	374 32,710	242 21,050	242 13,350
• Performance (Untreated Overflows, no./yr.) (Closure of CSOs)	16 0	4 - 7 0	0 11	1 - 3 0	1 - 3 0
Critical Siting Concerns		Local street closings during construction	Local street closings during construction	Tight corridor for conduit; traffic impacts	Tight corridor for conduit; traffic impacts
Capital Cost (millions)		\$3.4	\$55.0	\$54.0	\$68.5
Annual O & M Cost		\$0	\$0	\$400,000	\$55,000

1. The following notes apply to the measures of water quality benefit:
 - a. Bacteria standard exceedance hours, untreated CSO volume, nutrient and solids loads are derived based on a 1-year storm event.
 - b. The bacteria standards applied are for fecal coliform, as follows: boating, 1000/100ml; swimming 200/100ml.
 - c. The duration of the simulation period was 99.4 hours.
 - d. Nutrient load is from stormwater and CSOs; solids load is from stormwater, CSO, and upstream boundary, if applicable.
 - e. The number of untreated overflows per year is based on expected performance in a typical rainfall year.
 - f. The closure of CSOs represents the number of CSO outfalls that could be permanently closed.

TABLE 3-7 (con't). COMPARISON OF RECOMMENDED PLAN AND OTHER CONTROL ALTERNATIVES FOR ALEWIFE BROOK

Evaluation Criteria	Alternatives			Coarse Screening at Outfalls
	Consolidated Near Surface Storage with Separation at CAM004 (1 yr)	Consolidation/Storage Conduit with Separation at CAM004 (1 yr)	Consolidation/Storage Conduit (3 mo)	
Water Quality Benefit (1)				
• Boating (Bacteria Std. Exceedance, hrs.)	-	-	-	-
• Swimming (Bacteria Std. Exceedance, hrs.)	-	-	-	-
• Aesthetics (Untreated CSO vol., MG)	0	0	4.2	5.1
• Aquatic Life (Nutrient (TP) Load, lbs.) (Solids Load, lbs.)	324 22,770	324 22,770	350 25,700	372 27,000
• Performance (Untreated Overflows, no./yr.) (Closure of CSOs)	1 - 3 0	1 - 3 0	4 - 7 0	16 0
Critical Siting Concerns	Tight corridor for conduit; traffic impacts	Tight corridor for conduit; traffic impacts	Tight corridor for conduit; traffic impacts	Outfalls located along Alewife Brook's bank
Capital Cost (millions)	\$38.8	\$47.7	\$32.8	\$7.4
Annual O & M Cost	321,000	\$33,000	\$44,000	\$50,000

1. The following notes apply to the measures of water quality benefit:

- Bacteria standard exceedance hours, untreated CSO volume, nutrient and solids loads are derived based on a 1-year storm event.
- The bacteria standards applied are for fecal coliform, as follows: boating, 1000/100ml; swimming 200/100ml.
- The duration of the simulation period was 99.4 hours.
- Nutrient load is from stormwater and CSO; solids load is from stormwater, CSO, and upstream boundary, if applicable.
- The number of untreated overflows per year is based on expected performance in a typical rainfall year.
- The closure of CSOs represents the number of CSO outfalls that could be permanently closed.

storage tank in the vicinity of the Alewife MBTA station. The storage tank and conduit would have sufficient capacity to capture the one-year storm overflows for these outfalls. The tank would be dewatered by pumping the contents back into the Alewife Brook Conduit, following the end of the storm.

Consolidation/Storage Conduit (One-Year Storm Controls). A consolidation conduit running parallel to Alewife Brook, from RE041 to the Alewife Brook Pump Station, picking up outfalls CAM004 to SOM004, would have sufficient capacity to capture the one-year storm overflow volume from those outfalls. This consolidation conduit would have a pump out station in the vicinity of the Alewife Brook Pump Station to return the contents of the conduit to the Alewife Brook Conduit, down stream of the pump station, following the end of the storm.

Consolidation/Storage Conduit (Three-Month Storm Control). This alternative would be similar to the consolidation/storage conduit for one-year storm control, except that the conduit would not extend to outfalls SOM002A, SOM003, and SOM004, which are not active during the three-month storm. This conduit would be dewatered to the Alewife Brook Conduit upstream of the Alewife Brook Pump Station at the end of the storm.

Consolidation to Near Surface Storage with Separation at CAM004 (One-Year Storm Control). This alternative would be the same as the consolidation to near surface storage with one-year storm control, however, the separation of the combined areas tributary to outfall CAM004 would reduce the overall size of the facilities required to provide control of the one-year storm.

Consolidation/Storage Conduit with Separation at CAM004 (One-Year Storm Control). Separation of the combined areas tributary to outfall CAM004 would allow downsizing of the consolidation/storage conduit required to capture the one-year storm.

Coarse Screening at Outfalls. This alternative would involve the construction of manually cleaned bar screens in small chambers on each outfall conduit. The coarse screens would remove large objects from the overflows prior to being discharged to the Alewife Brook.

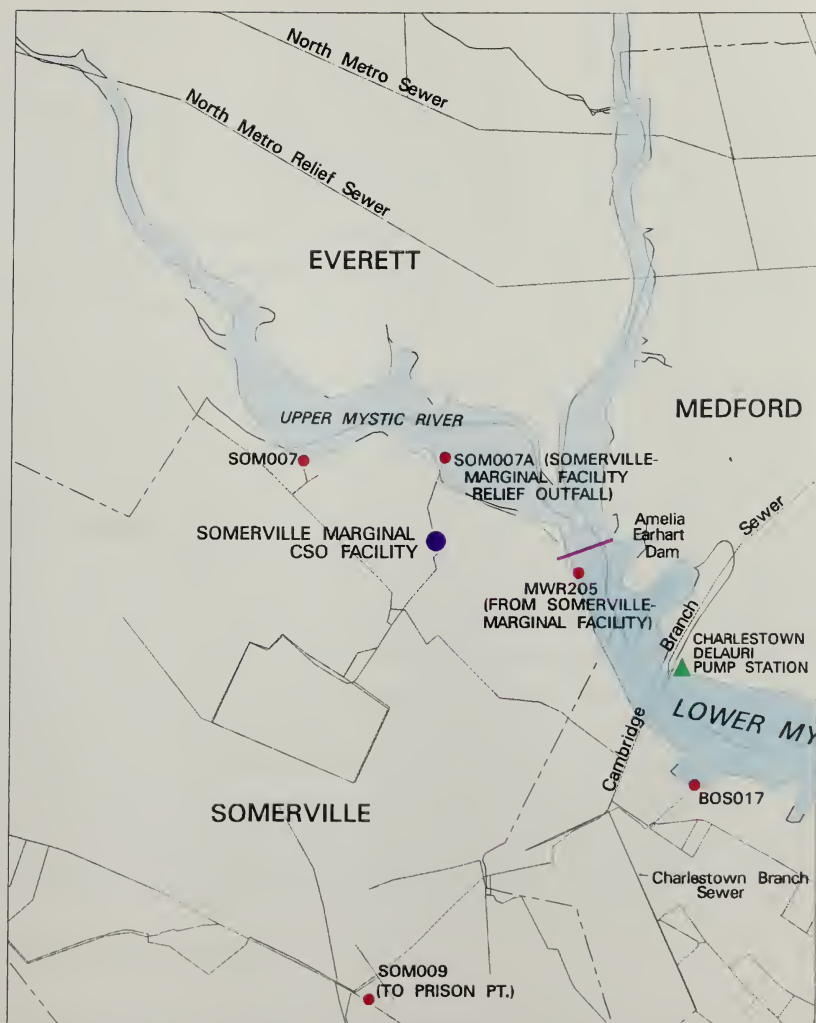
UPPER MYSTIC RIVER

Description of the Receiving Water Segment






The Upper Mystic River receiving water segment includes the Mystic River between the southern end of Mystic Lakes down to the Amelia Earhart Dam (Figure 3-8). The Mystic River forms part of the border between Arlington and Medford and between Somerville and Medford. Tributaries to the Mystic River include the Mill Brook, which enters just below the Lower Mystic Lake; the Alewife Brook, which flows in a little further downstream, and the Malden River, which enters just above the dam.

This receiving water segment is classified as SB-Fishable/Swimmable waterbody. There are no Massachusetts DEP-designated critical uses for this segment. Water-based uses of this section of the Mystic River are varied, including powerboating, canoeing, and fishing. Several yacht clubs and marinas are located along this stretch of the river and some of the homes adjacent to the river upstream in Medford have small piers. Public launching areas are also available. Although sailboat use is limited in some sections due to fixed bridges, instruction in small sailboats has historically been available. The Upper Mystic River is an anadromous fish run (alewives). There is no commercial shipping activity upstream of the Earhart Dam.

Land uses adjacent to the river include a large area on the north side of the river under the control of the MDC, known as the Mystic River Reservation. This area is extensively used for recreation, including walking, biking, and birdwatching. Land uses abutting the Reservation include heavily developed residential and commercial areas. Other developed park and playground facilities exist in both Somerville and Medford. The overall area is a



LEGEND

-  Existing Conduit
-  Pump Station
-  CSO Treatment Facility
-  Headworks
-  CSO Outfall

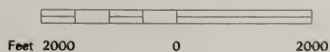


Figure 3-8
Upper Mystic

significant transportation corridor with several major roads and rail corridors crossing or running along the river. Immediately upstream of the Alewife Brook confluence, the river is bordered by broad grassy parkways. Between the Alewife Brook Pump Station and Route 93, there is parkland on the left side of the river bordered by a parkway. Beyond the parklands is predominantly residential land use. There is some commercial activity near the confluence with Alewife Brook.

There are two CSO outfalls located at the downstream end of the receiving water segment near the Amelia Earhart Dam. One of these CSOs (SOM007A) is a relief point on the effluent conduit from the Somerville Marginal CSO Facility. Under low tide conditions, screened and disinfected flows from the Somerville Marginal Facility are discharged at MWR205, downstream of the Amelia Earhart Dam. At high tide, tidal backwater can throttle the flow at MWR205, causing flow to back up in the Somerville Marginal Conduit until SOM007A activates. SOM007A discharges treated flows upstream of the dam. The other CSO, SOM007, is untreated. Figure 3-2 presents the total pollutant load and relative contributions to the load from CSO and stormwater for pollutants causing non-attainment of designated uses in the Upper Mystic River. As indicated in Figure 3-2, stormwater is the predominant source of fecal coliform bacteria for the 1-year storm, while upstream flow is the predominant source on an annual basis. For parameters other than fecal coliform bacteria, stormwater and upstream flow are also the predominant sources. Additional data on pollutant loads from CSO and stormwater sources are presented in Appendix A.

Description of CSO Alternatives

The CSO control alternatives evaluated in detail for this receiving water segment are summarized in Table 3-8, along with water quality benefits as compared with future planned conditions, critical siting issues, and costs. A brief description of the alternatives is presented below, and additional details on the recommended plan, sewer separation at SOM007 and continued treatment at Somerville Marginal CSO facility for SOM007A, are presented in Section Four.

**TABLE 3-8. COMPARISON OF RECOMMENDED PLAN AND OTHER
CONTROL ALTERNATIVES FOR UPPER MYSTIC RIVER**

Evaluation Criteria	Future Planned Conditions	Alternatives	
		Recommended Plan Sewer Separation SOM007 Con't Treat. at SOM007A	Sewer Separation SOM007 and CSO Relocation
• Boating (Bacteria Std. Exceedance, hrs.)	NA	NA	NA
• Swimming (Bacteria Std. Exceedance, hrs.)	NA	NA	NA
• Aesthetics (Untreated CSO vol., MG)	.03	0	0
• Aquatic Life (Solids Load, lbs.)	23,900	20,900	13,500
• Performance (Untreated Overflows, no./yr.) (Closure of CSOs)	2 0	0 1	0 2
Critical Siting Concerns		None	None
Capital Cost (millions)		\$ 0.1	\$ 23.3
Annual O & M Cost		\$ 5,000	\$ 160,000

1. The following notes apply to the measures of water quality benefit:

- Bacteria standard exceedance hours, untreated CSO volume, nutrient and solids loads are derived based on a 1-year storm event
- The bacteria standards applied are for fecal coliform, as follows: boating, 1000/100ml; swimming 200/100ml.
- The duration of the simulation period was 99.4 hours.
- Nutrient load is from stormwater and CSO; solids load is from stormwater, CSO, and upstream boundary, if applicable.
- The number of untreated overflows per year is based on expected performance in a typical rainfall year.
- The closure of CSOs represents the number of CSO outfalls that could be permanently closed.

Separation of SOM007 No Change at SOM007A. This alternative is the recommended plan. The common stormwater, sanitary sewer manholes upstream of SOM007 would be separated. SOM007A would continue to discharge treated flows at high tide during large storm events, however the frequency and volume would be reduced due to the recommended improvements to the Somerville Marginal CSO Facility described under Mystic/Chelsea Confluence.

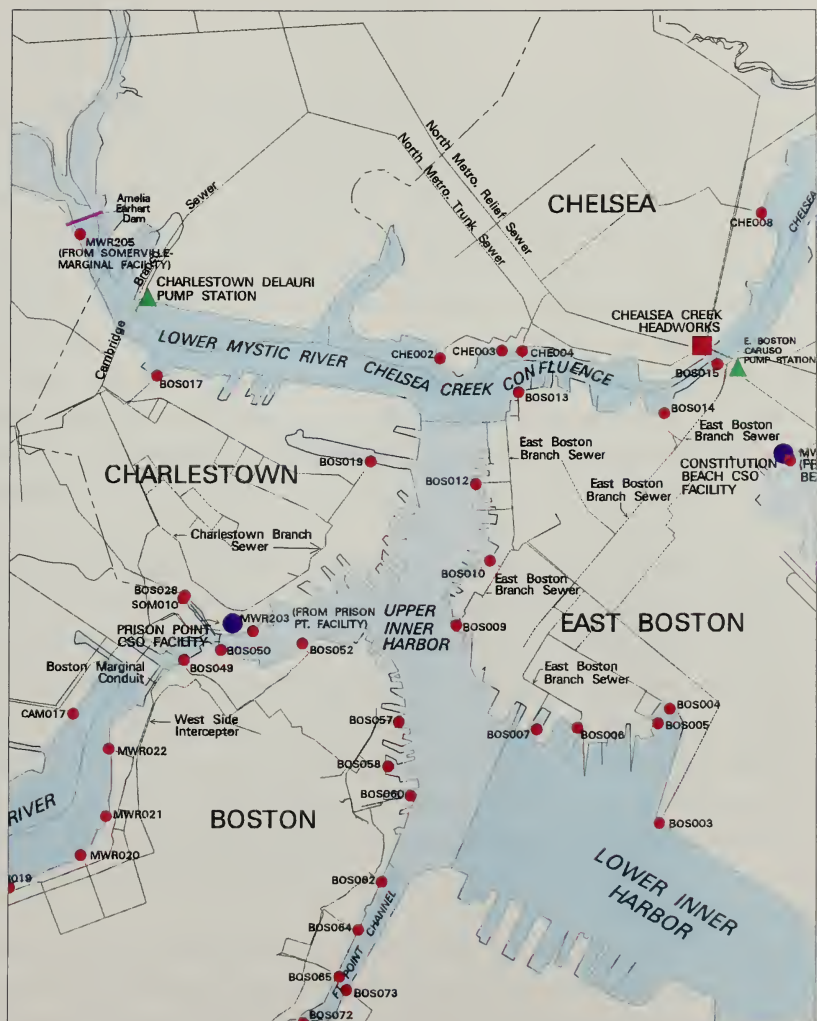
Sewer Separation at SOM007 and CSO Relocation at SOM007A. This alternative involves separating common stormwater, sanitary sewer manholes at SOM007 and the installation of a pump on the outfall conduit of the Somerville Marginal Facility. The pump would allow for discharge of overflows at MWR205 during high tide, and elimination of outfall SOM007A. Alternatives for the Somerville Marginal Facility and MWR205 are presented under the Mystic/Chelsea Confluence.

UPPER INNER HARBOR






Description of the Receiving Water Segment

The Upper Inner Harbor receiving water segment lies between downtown Boston, Charlestown, and East Boston. It includes the Charles River below the new Charles River Dam, the Mystic River below its confluence with Chelsea Creek, and the area between downtown Boston and East Boston (Figure 3-9). The harbor is channelized and deep in this segment. Freshwater from the two rivers mixes with seawater creating a salt-stratified region. The Inner Harbor is designated as Class SB-Fishable/Swimmable with restricted shellfishing. At this time, the only shellfish resource identified within this segment is one bed at the mouth of Chelsea Creek, but harvesting is prohibited. There are no Massachusetts DEP-designated critical uses in this segment.

Existing water-based uses in the Upper Inner Harbor predominantly involve maritime activities. The Upper Inner Harbor includes the main shipping channels (inbound/outbound)



LEGEND

-  Existing Conduit
-  Pump Station
-  CSO Treatment Facility
-  Headworks
-  CSO Outfall

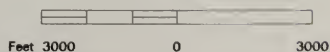


Figure 3-9
Mystic / Chelsea Confluence
Upper Inner Harbor

used by large freighters and tankers for deliveries to the industrial, energy and shipping facilities located along the waterfront, including a container facility in Charlestown and tank farms in the Chelsea Creek. Other water uses include the major public ferries located at Long and Rows Wharves. The Coast Guard base is also located in this area of the Harbor. Other boating uses in the Upper Inner Harbor include marinas and mooring areas associated with mixed use developments. Fishing off the harbor side of the new Charles River Dam and many other wharves and bridges is popular. Recreational fishing from small boats is also common, although commercial ship traffic sometimes restricts this activity. Some commercial lobstering takes place in this segment, especially in the early spring. A major offloading facility and pound for the commercial lobster fishery is located next to the Coast Guard Base.

Land uses in the area vary from maritime industrial uses in Charlestown and East Boston, where there is a federally designated port, to under-utilized piers along a portion of the East Boston waterfront. Much of the downtown Boston area and a portion of the Charlestown Navy Yard is dominated by mixed use developments of residential, office, and commercial space. Several waterfront parks exist in this segment. The shoreline of the area is bordered by busy downtown streets, the elevated Southeast Expressway, high density apartments, and Fanueil Hall Marketplace. The New England Aquarium on the downtown waterfront and the U.S.S. Constitution ship and museum, within the National Park in the Charlestown Navy Yard, are also located in this segment.

A total of ten CSOs discharge to the Upper Inner Harbor receiving water segment, including the Prison Point CSO facility (MWR203) which is the only treated discharge. Figure 3-2 presents the total pollutant load and relative contributions from CSO and stormwater for pollutants causing non-attainment of designated uses in the Upper Inner Harbor. As shown in Figure 3-2, CSOs contribute a significant percentage of the fecal coliform bacteria load during the 1-year storm, but upstream flow contributes virtually all of the bacteria load on an annual basis. CSOs also contribute substantially to nutrient loadings and floatables for the 1-year storm; but upstream flow predominates for most parameters, especially on an annual

basis. Additional data on pollutant loads from CSO and stormwater sources are presented in Appendix A.

Description of CSO Alternatives

The CSO control alternatives evaluated in detail for this receiving water segment are summarized in Table 3-9, along with water quality benefits as compared with future planned conditions, critical siting issues, and costs. Brief descriptions of the alternatives are presented below, and additional details on the recommended plan, dechlorination at MWR203, storage at BOS019 (three-month storm control) interceptor relief for BOS009 to BOS013, and coarse screening at BOS050 through BOS060, are provided in Section Four.

Dechlorination at MWR203; Storage at BOS019 (3 Month Storm Controls); Interceptor Relief for BOS009 through BOS013; and Coarse Screens at Outfalls BOS050 through BOS060. This alternative is the recommended plan. The existing Prison Point CSO facility would be upgraded with dechlorination equipment. A storage facility would be constructed in the vicinity of BOS019 with the capacity to capture the 3 month storm overflow volume. Interceptor relief would increase the capacity of the East Boston Branch Sewer thus reducing overflow volumes at outfalls BOS009 through BOS013. Manually cleaned coarse screens would be installed in the outfall conduits of the relatively inactive outfalls BOS050 through BOS060.

Complete Sewer Separation. This alternative would involve separating combined areas in Boston's North End, Charlestown, Cambridge, East Boston, and Somerville. Complete sewer separation of these areas would be difficult, since they are highly developed urban areas.

Storage at MWR203, Prison Point CSO Facility, and BOS019; Consolidation to Storage at BOS009 to BOS013, Consolidation/Storage Conduit from BOS057 to BOS060; Coarse Screens at BOS050 (One-Year Storm Control). This alternative would involve

TABLE 3-9. COMPARISON OF RECOMMENDED PLAN AND OTHER CONTROL ALTERNATIVES FOR UPPER INNER HARBOR

Evaluation Criteria	Alternatives			
	Future Planned Conditions	Recommended Plan Less Than Primary Treatment at MWR203; 3 mo Storage BOS019; Int. Relief BOS019-013; Coarse Screens BOS050 - 060 (1 yr)	Complete Sewer Separation	Individual Storage at MWR203 & BOS019; Consol. to Storage BOS009 - 013 Consol/Storage Conduit BOS050 - 060 (1 yr)
Water Quality Benefit (1)				
• Boating (Bacteria Std. Exceedance, hrs.)	0	0	0	0
• Swimming (Bacteria Std. Exceedance, hrs.)	38.3	NA	22.8	NA
• Aesthetics (Untreated CSO vol., MG)	5.81	2.87	0	0
• Aquatic Life (Dissolved Oxygen - BOD Load, lbs.) (Solids Load, lbs.)	159,000 111,000	158,000 106,000	131,000 91,700	132,000 85,400
• Performance (Untreated Overflows, no./yr.) (Closure of CSOs)	36 0	4-7 0	0 10	1-3 0-3
Critical Siting Concerns		For East Boston local street closings during construction; sensitive site at BOS019	Local street closings during construction	Difficult/tight consol./storage conduit route; siting constraints for storage facilities
Capital Cost (millions)		\$22.0	\$88.5	\$214
Annual O & M Cost			\$0	\$1,700,000

1. The following notes apply to the measures of water quality benefit:

- Bacteria standard exceedance hours, untreated CSO volume, nutrient and solids loads are derived based on a 1-year storm event.
- The bacteria standards applied are for fecal coliform, as follows: boating, 1000/100ml; swimming 200/100ml.
- The duration of the simulation period was 99.4 hours.
- Nutrient load is from stormwater and CSO; solids load is from stormwater, CSO, and upstream boundary, if applicable.
- The number of untreated overflows per year is based on expected performance in a typical rainfall year.
- The closure of CSOs represents the number of CSO outfalls that could be permanently closed.

**TABLE 3—9(con't). COMPARISON OF RECOMMENDED PLAN AND OTHER
CONTROL ALTERNATIVES FOR UPPER INNER HARBOR**

Evaluation Criteria	Alternatives			
	Primary Treatment at MWR203 & BOS019; Consol. to Primary Treat. BOS009 — 013; Consol./Storage BOS050 — 060 (1 yr)	Individual Storage at MWR203 & BOS019; Interceptor relief BOS009 — 013; Coarse Screens BOS050 — 060 (3 mo)	Primary Treatment at MWR203 & BOS019; Consol. to Primary Treat. BOS009 — 013; Coarse Screens BOS050 — 060 (3 mo)	Upgrade MWR203; Coarse Screens at Remaining Outfalls
Water Quality Benefit (1)				
• Boating (Bacteria Std. Exceedance, hrs.)	0	0	0	0
• Swimming (Bacteria Std. Exceedance, hrs.)	NA	NA	NA	NA
• Aesthetics (Untreated CSO vol., MG)	0	3.78	1.24	5.81
• Aquatic Life (Dissolved Oxygen — BOD Load, lbs.) (Solids Load, lbs.)	146,000 105,000	146,000 105,000	155,000 125,000	158,000 130,000
• Performance (Untreated Overflows, no./yr.) (Closure of CSOs)	1 — 3 0 — 3	4 — 7 0	4 — 7 0 — 2	36 0
Critical Siting Concerns	Difficult siting for treatment facility	Sensitive site for BOS019 Facility	Tight corridor for consolidation conduit	None
Capital Cost (millions)	\$109.0	\$85.0	\$60.0	\$12.1
Annual O & M Cost	\$2,090,000	\$1,180,000	\$1,810,000	\$1,100,00

1. The following notes apply to the measures of water quality benefit:

- Bacteria standard exceedance hours, untreated CSO volume, nutrient and solids loads are derived based on a 1-year storm event.
- The bacteria standards applied are for fecal coliform, as follows: boating, 1000/100ml; swimming 200/100ml.
- The duration of the simulation period was 99.4 hours.
- Nutrient load is from stormwater and CSOs; solids load is from stormwater, CSO, and upstream boundary, if applicable.
- The number of untreated overflows per year is based on expected performance in a typical rainfall year.
- The closure of CSOs represents the number of CSO outfalls that could be permanently closed.

constructing additional storage at the Prison Point CSO Facility and constructing a storage facility at BOS019. These facilities would have the capacity to capture the one-year overflow volumes from these outfalls. This alternative would also involve constructing a consolidation conduit to capture one-year overflow volumes from BOS009 through BOS013 and convey them to a storage facility. A consolidation conduit would be constructed to capture and store one-year overflow volumes from outfalls BOS057 through BOS060. Manually cleaned coarse bar screens would be installed on the overflow conduit for outfall BOS050, which is not active during the one-year storm. The coarse screens would remove large objects from the overflows before the flow is discharged to the Upper Inner Harbor. All storage facilities/conduits would be dewatered by pumps following the storm, returning the captured overflows to the wastewater collection system.

Primary Treatment at MWR203 and BOS019; Consolidation to Primary Treatment for BOS009 through BOS013; Consolidation/Storage Conduit for BOS057 through BOS060; Coarse Screens at BOS050 (One-Year Storm Control). This alternative is similar to above except that the facilities at Prison Point, and BOS019, and the consolidation facility for BOS009 through BOS013 would be sized to provide primary treatment for the one-year storm. Some smaller storms may be completely stored by these facilities and returned to the interceptors following the storms.

Storage at MWR203 and BOS019, Interceptor Relief at BOS009 through BOS013, and Coarse Screening for Outfalls BOS050 through BOS060 (Three-Month Storm Controls). This alternative is similar to the recommended plan, except that storage would be added to the Prison Point Facility sufficient to capture three-month storm overflow volumes at this outfall.

Primary Treatment at MWR203 and BOS019; Consolidation to Primary Treatment for BOS009 through 013; and Coarse Screens for Outfalls BOS050 through BOS060 (Three-Month Storm Controls). This alternative is similar to the primary treatment at MWR203 with one-year control, except that no consolidation/storage conduit would be constructed for

BOS057 through BOS060, instead manually cleaned coarse bar screens would be installed in the outfall conduits. BOS057 through BOS060 are not active during the three-month storm.

Dechlorination at MWR203 and Coarse Screens at all Other Outfalls. This alternative involves upgrading the existing Prison Point CSO Facility for dechlorination, which is part of the recommended plan. Manually cleaned coarse bar screens would be installed in the outfall conduits for all other outfalls tributary to the Upper Inner Harbor.

LOWER INNER HARBOR

Description of the Receiving Water Segment

The Lower Inner Harbor receiving water segment lies between South Boston and East Boston near Logan Airport (Figure 3-4). It includes the two shipping channels for the port of Boston. The Third Harbor Tunnel is currently being constructed in the area. The Lower Inner Harbor is classified as SB-Fishable/Swimmable with restricted shellfishing. At this time, there are no identified shellfish resources within this area. There are no Massachusetts DEP-designated critical uses in this segment.

Water-based uses primarily consist of maritime industrial facilities, including the Boston Marine Industrial Park. The Fish Pier, a landing area for offshore and local fisheries, is also located here. Fishing is popular where there is public access to wharves and bridges along the waterfront. Recreational fishing from small boats is also common, but restricted by commercial ship traffic. Some commercial lobstering takes place.

Land uses along the waterfront in South Boston support maritime industries, and fish landing and processing. On the East Boston side of the harbor, land use is dominated by Logan International Airport and related facilities. Northwest of the airport, the shore is lined with dilapidated piers, ship drydock and repair facilities. Behind these facilities there are multi-family housing developments.

Five untreated CSOs discharge to the Lower Inner Harbor receiving water segment. Figure 3-2 presents the total pollutant load and relative contributions to the load from CSO and stormwater for pollutants causing non-attainment of designated uses. As indicated in Figure 3-2, CSOs contribute about one-half of the fecal coliform bacteria load for the 1-year storm, and an even greater portion of the bacteria load in a typical year. During a 1-year storm, CSOs also contribute the majority of the toxics loading. For other parameters, stormwater is the predominant source of pollutant loads for the 1-year storm and on an annual basis. Additional data on pollutant loads from CSO and stormwater sources are presented in Appendix A.

Description of CSO Alternatives

The CSO control alternatives evaluated in detail for this receiving water segment are summarized in Table 3-10, along with water quality benefits as compared with future planned conditions, critical siting issues, and costs. Brief descriptions of the alternatives are presented below, and additional details on the recommended plan, interceptor relief, are provided in Section Four.

Interceptor Relief for BOS003 through BOS007 (3-month Storm Control). This alternative is the recommended plan. The capacity of the East Boston Branch Sewer would be increased, which would eliminate 3 month storm overflows at outfalls BOS003 through BOS007.

Complete Sewer Separation. This alternative would involve separation of combined areas upstream of regulators along the East Boston Branch Sewer discharging to outfalls BOS003 through BOS007.

Consolidation to Near Surface Storage for BOS003 through BOS007 (1-Year Storm Controls). This alternative would involve constructing a consolidation conduit, running along the harbor, picking up outfalls BOS003 through BOS007 and conveying their overflows

TABLE 3-10. COMPARISON OF RECOMMENDED PLAN AND OTHER CONTROL ALTERNATIVES FOR LOWER INNER HARBOR

Evaluation Criteria	Future Planned Conditions	Alternatives		
		Recommended Plan Interceptor Relief (3 mo)	Complete Sewer Separation	Consolidation to Near Surface Storage BOS003 - 007 (1 yr)
Water Quality Benefit (1)				
• Boating (Bacteria Std. Exceedance, hrs.)	4.1	0.0	0.0	0.0
• Swimming (Bacteria Std. Exceedance, hrs.)	37.2	15.5	15.5	23.8
• Aquatic Life (Dissolved Oxygen - BOD Load, lbs.) (Solids Load, lbs.)	17,700 33,700	17,200 32,500	16,200 31,200	14,600 28,100
• Performance (Untreated Overflows, no./yr.) (Closure of CSOs)	29 0	4-7 0	0 5	1-3 1-2
Critical Siting Concerns		Local street closings during construction	Local street closings during construction	Residences and local traffic impacted
Capital Cost (millions)		\$20.0	\$58.4	\$43.0
Annual O & M Cost		\$0	\$0	\$470,000

1. The following notes apply to the measures of water quality benefit:

- Bacteria standard exceedance hours, untreated CSO volume, nutrient and solids loads are derived based on a 1-year storm event.
- The bacteria standards applied are for fecal coliform, as follows: boating, 1000/100ml; swimming 200/100ml.
- The duration of the simulation period was 99.4 hours.
- Nutrient load is from stormwater and CSO; solids load is from stormwater, CSO, and upstream boundary, if applicable.
- The number of untreated overflows per year is based on expected performance in a typical rainfall year.
- The closure of CSOs represents the number of CSO outfalls that could be permanently closed.

TABLE 3-10 (con't). COMPARISON OF RECOMMENDED PLAN AND OTHER CONTROL ALTERNATIVES FOR LOWER INNER HARBOR

Evaluation Criteria	Alternatives		
	Consolidation to Primary Treatment (1 yr)	Diversion to Storage in BOS003 Outfall (3 mo)	Coarse Screening at Outfalls
Water Quality Benefit (1)			
• Boating (Bacteria Std. Exceedance, hrs.)	NA	NA	NA
• Swimming (Bacteria Std. Exceedance, hrs.)	NA	NA	NA
• Aquatic Life (Dissolved Oxygen - BOD Load, lbs.) (Solids Load, lbs.)	16,100 30,100	17,200 32,500	17,700 33,400
• Performance (Untreated Overflows, no./yr.) (Closure of CSOs)	0 1-2	4-7 0-1	29 0
Critical Siting Concerns	Local traffic impacts	Local traffic impacts	None
Capital Cost (millions)	\$33.0	\$15.0	\$13.0
Annual O & M Cost	\$594,000	\$66,000	\$39,000

1. The following notes apply to the measures of water quality benefit:

- Bacteria standard exceedance hours, untreated CSO volume, nutrient and solids loads are derived based on a 1-year storm event.
- The bacteria standards applied are for fecal coliform, as follows: boating, 1000/100ml; swimming 200/100ml.
- The duration of the simulation period was 99.4 hours.
- Nutrient load is from stormwater and CSO; solids load is from stormwater, CSO, and upstream boundary, if applicable.
- The number of untreated overflows per year is based on expected performance in a typical rainfall year.
- The closure of CSOs represents the number of CSO outfalls that could be permanently closed.

to a near surface storage facility. This facility would have a sufficient capacity to capture one-year storm overflow volumes. Following the storm, the contents of the facility would be pumped to the East Boston Branch Sewer.

Consolidation to Primary Treatment for BOS003 through BOS007 (1-Year Storm Controls). This alternative is similar to consolidation to near surface storage with one-year storm controls, except overflow would receive primary treatment and be discharged to the Lower Inner Harbor. Overflows from some smaller storms would be entirely captured and returned to the East Boston Branch Sewer following the storms.

Diversion to Storage in BOS003 Outfall (3-Month Storm Controls). This alternative would involve constructing a consolidation conduit to divert flow from outfalls BOS004 through BOS007 to the BOS003 outfall conduit. An hydraulic gate on the BOS003 outfall would retain flow in the outfall conduit, opening only to relieve volumes in excess of the storage capacity of the conduit. The existing outfall conduit and the consolidation conduit would have sufficient capacity to store 3-month storm overflow volumes for all these outfalls. A pumpout station would be provided so that following the storm, the contents of the outfall conduit would be pumped back to the East Boston Branch Sewer.

Coarse Screening. Manually cleaned coarse bar screens would be installed in each outfall conduit tributary to the Lower Inner Harbor. The screens would remove large objects from overflows before they are discharged to the harbor.

MYSTIC/CHELSEA CONFLUENCE

Description of the Receiving Water Segment

The Mystic/Chelsea Confluence receiving water segment includes the marine portion of the Mystic River, below the Amelia Earhart Dam, and the Chelsea Creek (Figure 3-9). It is relatively deep with tidal flushing. The segment is surrounded by East Boston, Chelsea,

Everett, and Charlestown. The Mystic River/Chelsea Creek Confluence receiving water segment is classified as Class SB-Fishable/Swimmable with restricted shellfishing. No shellfish resources are currently identified in this segment, and there are no Massachusetts DEP-designated critical uses. Existing water-based uses in this segment include fishing and boating, but most of the waterfront is dominated by industrial maritime uses. Much of this area falls into either the Mystic River or Chelsea Creek Designated Deep Port Area.

The Moran Container Terminal is on the south side of the Mystic River above the Tobin Bridge. Opposite the terminal is a scrap metal loading facility. The Chelsea River has several tank farms on its banks, and there is also a minerals unloading and storage area on the north side of the river. The Boston Edison Power Plant is located along the Everett shore. The Chelsea waterfront is primarily industrial land with some smaller vacant parcels. Behind these activities is dense urban housing. The Tobin Bridge passes over the Mystic River and the McClellan Highway is on the east bank of the Chelsea Creek.

There are 9 CSOs along both banks of the Chelsea Creek and along the south bank of the Mystic River. Except for the Somerville Marginal CSO facility (MWR205), none of the CSO discharges is treated. Figure 3-2 presents the total pollutant load and the relative contributions from CSO and stormwater to the load for pollutants causing non-attainment of designated uses in the Mystic/Chelsea Confluence receiving water segment. As indicated in Figure 3-2, upstream river flow contributes significantly to pollutant loads, especially on an annual basis. CSOs do contribute a large percentage of the fecal coliform bacteria load for the 1-year storm, but are insignificant for the typical year. CSOs also contribute a large percentage of the nutrient load for the 1-year storm, but not as large as the percentage from stormwater. Additional data on pollutant loads from CSO and stormwater sources is presented in Appendix A.

Description of CSO Alternatives

The CSO control alternatives evaluated in detail for this receiving water segment are summarized in Table 3-11, along with water quality benefits as compared with future planned conditions, critical siting issues, and costs. Brief descriptions of the alternatives are presented below, and additional details on the recommended plan, storage at MWR205, screen and disinfect BOS014, BOS017 and CHE008; and interceptor relief for CHE002 through CHE004 (3-Month Storm Controls), are presented in Section Four, while comments on the other alternatives are presented below.

The existing Somerville Marginal CSO Facility must be relocated as part of planned modifications to Route I-93. A common aspect of all alternatives is that regardless of the proposed level of control for MWR205, use of the existing Somerville Marginal CSO Facility will not be part of the alternatives. Another project common to all alternatives will be interceptor relief for Chelsea outfalls CHE002 to CHE004. This project was originally developed as an intermediate project, and is now being incorporated into the recommended CSO control plan.

Storage at MWR205; Screening and Disinfection at BOS014, BOS017 and CHE008; and Interceptor Relief CHE002 through CHE004 (3-Month Storm Controls). The Somerville Marginal Facility would be upgraded to provide storage for 3 month storm overflow volumes. Individual screening and disinfection facilities would be constructed in the vicinities of BOS014, BOS017 and CHE008. These facilities would provide flow through treatment of overflows at the three outfalls. The capacity of a Chelsea community sewer, which conveys flows from CSO regulators tributary to CHE002 through CHE004, would be increased. This would eliminate 3-month overflows at outfalls CHE002 through CHE004.

Complete Sewer Separation. This alternative would involve separation of combined areas in portions of Somerville, Charlestown and East Boston and all of Chelsea.

TABLE 3-11. COMPARISON OF RECOMMENDED PLAN AND OTHER CONTROL ALTERNATIVES FOR MYSTIC / CHELSEA CONFLUENCE

Evaluation Criteria	Future Planned Conditions	Alternatives			Primary Treatment at MWR205, BOS017 and CHE008; Storage at BOS014
		Recommended Plan Storage at MWR205; Screen/Disinfect. BOS014, BOS017 and CHE008 (3 mo)	Complete Sewer Separation	Storage at MWR205; BOS014, BOS017 and CHE008 (1 yr)	
Water Quality Benefit (1)					
• Boating (Bacteria Std. Exceedance, hrs.)	(2) CC: 10.4 MR: 0.0	NA	CC: 0.0 MR: 0.0	CC: 0.0 MR: 0.0	NA
• Swimming (Bacteria Std. Exceedance, hrs.)	CC: 34.2 MR: 34.2	NA	CC: 26.9 MR: 27.9	CC: 24.9 MR: 26.9	NA
• Aesthetics (Untreated CSO vol., MG)	4.55	0	0	0	0
• Aquatic Life (Dissolved Oxygen - BOD Load, lbs.) (Solids Load, lbs.)	29,400 55,300	26,200 49,200	27,700 17,200	20,000 38,500	24,700 45,000
• Performance (Untreated Overflows, no./yr.) (Closure of CSOs)	35 0	0 0	0 8	1 - 3 0	0 0
Critical Siting Concerns					
		Siting of MWR205 coordinate with 1-93 relocation	Local street closings during construction	Siting of MWR205 coordinate with 1-93 relocation	Siting of MWR205 coordinate with 1-93 relocation
Capital Cost (millions)		\$25.2	\$112.6	\$75.4	\$39.4
Annual O & M Cost		\$770,000	\$0	\$670,000	\$1,390,000

1. The following notes apply to the measures of water quality benefit:

- Bacteria standard exceedance hours, untreated CSO volume, nutrient and solids loads are derived based on a 1-year storm event.
 - The bacteria standards applied are for fecal coliform, as follows: boating, 1000/100ml; swimming 200/100ml.
 - The duration of the simulation period was 99.4 hours.
 - Nutrient load is from stormwater and CSO; solids load is from stormwater, CSO, and upstream boundary, if applicable.
 - The number of untreated overflows per year is based on expected performance in a typical rainfall year.
 - The closure of CSOs represents the number of CSO outfalls that could be permanently closed.
2. Data locations at Mystic River, near mouth (MR) and Chelsea Creek, near mouth (CC).

TABLE 3-11(cont'd). COMPARISON OF RECOMMENDED PLAN AND OTHER
CONTROL ALTERNATIVES FOR MYSTIC / CHELSEA CONFLUENCE

Evaluation Criteria	Alternatives		
	Dechlorination MWR205, Screen/Disinfection BOS014, BOS017 and CHE008 (1 yr)	Storage MWR205, BOS017 and CHE008; Coarse Screen BOS014 (3 mo)	Primary Treat. MWR205, BOS017; Storage CHE008; Screen BOS014 (3 mo)
Water Quality Benefit (1)			
• Boating (Bacteria Std. Exceedance, hrs.)	NA	CC: 2.1 MR: 0.0 (2)	NA
• Swimming (Bacteria Std. Exceedance, hrs.)	NA	CC: 28.0 MR: 29.0	NA
• Aesthetics (Untreated CSO vol., MG)	0	0.6	0
• Aquatic Life (Dissolved Oxygen – BOD Load, lbs.) (Solids Load, lbs.)	\$29,400 \$54,600	\$26,000 \$48,900	\$27,700 \$51,200
• Performance (Untreated Overflows, no./yr.) (Closure of CSOs)	0 0	1-3 0	0 0
Critical Siting Concerns	Siting of MWR205 coordinate with 1-93 relocation	Siting of MWR205 coordinate with 1-93 relocation	Siting of MWR205 coordinate with 1-93 relocation
Capital Cost (millions)	\$7.2	\$29.9	\$16.0
Annual O & M Cost	\$820,000	\$380,000	\$700,000

1. The following notes apply to the measures of water quality benefit:

- Bacteria standard exceedance hours, untreated CSO volume, nutrient and solids loads are derived based on a 1-year storm event.
 - The bacteria standards applied are for fecal coliform, as follows: boating, 1000/100ml, swimming 200/100ml.
 - The duration of the simulation period was 99.4 hours.
 - Nutrient load is from stormwater and CSOs; solids load is from stormwater, CSO, and upstream boundary, if applicable.
 - The number of untreated overflows per year is based on expected performance in a typical rainfall year.
 - The closure of CSOs represents the number of CSO outfalls that could be permanently closed.
2. Data locations at Mystic River, near mouth (MR) and Chelsea Creek, near mouth (CC).

Storage at MWR205, BOS014, BOS017 and CHE008 (1 Year Storm Controls). Storage facilities would be constructed in the vicinities of these four outfalls. The facilities would have sufficient capacity to capture one-year storm overflow volumes. Following the storm, the captured volume would be returned to the interceptor system.

Primary Treatment at MWR205, BOS017, and CHE008; Storage at BOS014 (One-Year Storm Controls). This alternative involves the construction of primary treatment facilities in the vicinities of outfalls MWR205, BOS017, and CHE008. These facilities would have the capacity to provide primary treatment to one-year storm overflow volumes at these outfalls. The treated flow would be discharged to the Mystic River/Chelsea Creek Confluence. Some smaller storm overflow volumes would be completely captured by the facilities and returned to the interceptor system following the storm. This alternative would also involve the construction of a storage facility in the vicinity of outfall BOS014 with the capacity to capture one-year storm overflow volumes at this outfall. The contents of the tank would be returned to the East Boston Branch Sewer following the end of the storm. A primary treatment facility at BOS014 would require a tank volume greater than the one-year storm volume.

Storage at MWR205, BOS017, and CHE008; Coarse Screening at BOS014 (Three-Month Storm Controls). This alternative is similar to the storage at MWR205, BOS014, BOS017 and CHE008 for one-year storm control, except that the facilities would be sized for the three-month storm. Manually cleaned bar screens would be installed in the BOS014 outfall conduit, since BOS014 is not active during the three-month storm.

Primary Treatment at MWR205 and BOS017; Storage CHE008; and Coarse Screening at BOS014 (3-Month Storm Control). Under this alternative, primary treatment facilities at MWR205 and BOS017 would be sized for the three-month storm. A storage facility would be constructed in the vicinity of outfall CHE008 and manually cleaned bar screens would be installed in the BOS014 outfall conduit.

RESERVED CHANNEL

Description of the Receiving Water Segment

The Reserved Channel is a narrow shipping channel located in South Boston. Its mouth lies at the mouth of the Inner Harbor (Figure 3-1). The Reserved Channel is classified as Class SB-Fishable/Swimmable with restricted shellfishing. There are no shellfish resources identified within the channel, and no Massachusetts DEP-designated critical uses. Existing water-based uses are confined to boating and industrial maritime activities. The Reserved Channel is a designated port area. There is deep water access and adjacent land uses include large pier and wharf areas used for container shipping. The north side of the channel is bordered by a ship terminal and warehouses. The south side has a container port at the mouth extending to Castle Island. Upstream is an oil tank farm, and a large thermal power station. There is also some commercial activity and several small marinas. A low bridge crosses the channel near the upstream end. Residential areas in South Boston abut these maritime areas.

Four untreated CSOs discharge to the Reserved Channel. Figure 3-2 presents the total pollutant load and the relative contributions to the load from CSO and stormwater for pollutants causing non-attainment of designated uses in the Reserved Channel receiving water segment. As indicated in Figure 3-2, CSOs contribute a far greater percentage of the fecal coliform bacteria load than stormwater. CSOs are also the predominant source of nutrients in this segment. Additional data on pollutant loads from CSO and stormwater sources are presented in Appendix A.

Description of CSO Alternatives

The CSO control alternatives evaluated in detail for this receiving water segment are summarized in Table 3-12, along with water quality benefits as compared with future planned conditions, critical siting issues, and costs. Brief descriptions of the alternatives are

**TABLE 3-12. COMPARISON OF RECOMMENDED PLAN AND OTHER
CONTROL ALTERNATIVES FOR RESERVED CHANNEL**

Evaluation Criteria	Future Planned Conditions	Alternatives				
		Recommended Plan Consolidation to Screen & Disinf. Fac. BOS076-080	Complete Sewer Separation	Consolidated Storage BOS076-080 (1 Yr)	Consolidated Storage BOS080-076 (1 Yr)	Consolidated Primary Treatment BOS076-080 (1 Yr)
Water Quality Benefit (1)						
• Boating (Bacteria Std. Exceedance, hrs.)	0	0	0	0	0	0
• Swimming (Bacteria Std. Exceedance, hrs.)	23.8	0	0	0	0	0
• Aquatic Life (Solids Load, lbs.)	12800	9.36	2800	2300	2300	4290
• Performance (Untreated Overflows, no./yr.- (Closure of CSOs)	44 0	0 0-2	0 4	1-3 0-2	1-3 0-2	0 0-2
Critical Siting Concerns		Residences and playground impacted	Local street closings during construction	Residences and play-ground impacted	Residences and truck traffic impacted; restricted site BOS076	Residences and truck traffic impacted
Capital Cost (millions)		\$ 41.3	\$ 54.8	\$ 68.1	\$ 65.5	\$ 57.3
Annual O & M Cost		\$ 610,000	\$ 0	\$ 570,000	\$ 570,000	1,150,000

1. The following notes apply to the measures of water quality benefit:

- Bacteria standard exceedance hours, untreated CSO volume, and solids loads are derived based on a 1-year storm event.
- The bacteria standards applied are for fecal coliform, as follows: boating, 1000/100ml; swimming 200/100ml.
- The duration of the simulation period was 99.4 hours.
- Nutrient load is from stormwater and CSOs; solids load is from stormwater, CSO, and upstream boundary, if applicable.
- The number of untreated overflows per year is based on expected performance in a typical rainfall year.
- The closure of CSOs represents the number of CSO outfalls that could be permanently closed.

**TABLE 3 - 12(cont). COMPARISON OF RECOMMENDED PLAN AND OTHER
CONTROL ALTERNATIVES FOR RESERVED CHANNEL**

Evaluation Criteria	Alternatives				
	Consolidate BOS080-076 to Primary Treatment (1Yr)	Consolidate BOS080-076 to Screen/Disinf. Facility (3 Mo)	Consolidate BOS076-080/ to Storage Facility (3 Mo)	Consolidate BOS080-076 to Primary Treatment (3 Mo)	Coarse Screens at Outfalls BOS080-076
Water Quality Benefit (1)					
• Basting (Bacteria Std. Exceedance, hrs.)	0	0	0	0	0
• Swimming (Bacteria Std. Exceedance, hrs.)	0	0	0	0	2.8
• Aquatic Life (Solids Load, lbs.)	5230	10,840	8,210	8,210	12,273
• Performance (Unreated Overflows, no./yr.) (Closure of CSOs)	0 0-2	0 0-2	4-6 0-2	4-6 0-2	44 0
Critical Siting Concerns	Residences and truck traffic impacted; restricted site at BOS076 \$ 49.5	Residences and truck traffic impacted; restricted site at BOS076 \$ 33.4	Residences and play- ground impacted \$ 41.6	Residences and truck traffic impacted; restricted site at BOS076 \$ 40.6	Residences and truck traffic impacted; restricted site at BOS076 \$ 38.1
Capital Cost (millions) Annual O & M Cost	\$ 1,160,000	\$ 610,000	\$ 390,000	\$ 540,000	\$ 1,100,000
					\$ 4.0 \$ 260,000

1. The following notes apply to the measures of water quality benefit:

a. Bacteria standard exceedance hours, untreated CSO volume, and solids loads are derived based on a 1-year storm event.

b. The bacteria standards applied are for fecal coliform, as follows: boating, 1000/100ml; swimming, 200/100ml.

c. The duration of the simulation period was 99.4 hours.

d. Nutrient load is from stormwater and CSO; solids load is from stormwater, CSO, and upstream boundary, if applicable.

e. The number of untreated overflows per year is based on expected performance in a typical rainfall year.

f. The closure of CSOs represents the number of CSO outfalls that could be permanently closed.

presented below, and additional details on the recommended plan, consolidation to a screening and disinfection facility are presented in Section Four.

Consolidation to Screen and Disinfection Facility, BOS076 to BOS080. This alternative is the recommended plan. A consolidation conduit running from outfall BOS076 to outfall BOS080 would convey overflow volumes to a flow through, screening and disinfection facility located in the vicinity of outfall BOS080. This facility would also treat flows from the North Dorchester Bay CSO relocation conduit.

Complete Sewer Separation. This alternative would involve the separation of combined areas upstream of regulators discharging to BOS076 to BOS080. Complete separation of these areas would not allow elimination of the outfalls unless downstream areas on the South Boston Interceptor North Branch are also separated. Otherwise, surcharging in the interceptor may still cause overflow activations to the Reserved Channel.

Consolidation to Near Surface Storage Facility for BOS076 to BOS080 (One-Year Storm Controls). A consolidation conduit running parallel to the Reserved Channel, picking up outfalls BOS076 to BOS080, would have sufficient capacity in combination with the storage facility to capture the one-year storm overflow volume from the outfalls. A storage facility would be constructed in the vicinity of BOS080. The contents of the conduit and storage facility would be returned to the SBI/North Branch following the end of the storm.

Consolidation to Near Surface Storage Facility for BOS080 to BOS076 (One-Year Storm Controls). This alternative is similar to consolidation to near surface storage facility for BOS076 to BOS080 with one-year storm controls, except that the storage facility would be constructed in the vicinity of BOS076. Also, the consolidation conduit would be smaller and the storage facility larger in this alternative, since outfall BOS076 has the largest overflow volumes of any outfall in this receiving water segment.

Consolidation to Near Surface Primary Treatment BOS076 to BOS080 (One-Year Storm Controls). This alternative is similar to consolidation to near surface storage facility for BOS076 to BOS080 with one-year storm controls, except the facility would have the capacity to provide primary treatment to one-year storm overflow volumes. Treated overflow would be discharge to the Reserved Channel. Some smaller storms would be completely captured by the consolidation conduit and facility. These storm overflow volumes would be returned to the SBI, following the storm.

Consolidation to Near Surface Primary Treatment BOS080 to BOS076 (One-Year Storm Controls). This alternative is similar to the alternative above, except that the consolidation conduit would flow from BOS080 to BOS076 and the primary treatment facility would be in the vicinity of outfall BOS076.

Consolidation, Screen and Disinfection Facility, BOS080 to BOS076 (One-Year Storm Controls). This alternative involves a consolidation conduit running from BOS080 to BOS076 and a flow through screening and disinfection facility located near outfall BOS076. This alternative is similar to the recommended plan except for the direction of flow in the consolidation conduit and the location of the facility.

Consolidation to Near Surface Storage Facility BOS076 to BOS080 (3-Month Storm Controls). This alternative is the same as consolidation to near surface storage facility at BOS080 for the one-year storm except the consolidation conduit and storage facility would store the three-month storm.

Consolidation to Near Surface Storage Facility BOS080 to BOS076 (3-Month Storm Controls). This alternative is the same as consolidation to near surface storage facility at BOS076 for the one-year storm except the consolidation conduit and storage facility would store the three-month storm.

Consolidation to Near Surface Primary Treatment Facility BOS080 to BOS076 (3-Month Storm Controls). This alternative is the same as the above alternative, except the tank would be sized for primary treatment.

Coarse Screens at Outfalls. This alternative involves the construction of manually cleaned coarse bar screens in all the outfall conduits tributary to the Reserved Channel. The coarse screens would remove large objects from the overflows before they are discharged to the Reserved Channel.

FORT POINT CHANNEL

Description of the Receiving Water Segment

The Fort Point Channel is a narrow, shallow embayment off the upper part of the Inner Harbor, which separates South Boston from the downtown area (Figure 3-1). Fort Point Channel is classified as Class SB-Fishable/Swimmable with restricted shellfishing. No shellfish resources have been identified within the channel, and there are no Massachusetts DEP-designated critical uses for this segment. Existing water-based uses include recreational fishing from the bridges and wharves lining the channel, and both powerboating (including fishing vessels) and barge activities.

Land-side uses in the vicinity of Fort Point Channel include a mix of industrial facilities, seafood handling facilities, transportation corridor uses, and cultural uses (Tea Party Ship, Children's Museum). The Children's Museum has constructed a barge in the channel to conduct an urban ecology program. Other major land uses include a large Post Office facility, an MBTA train maintenance facility, and large parking areas. The upstream end of the channel is bordered by a major highway interchange. The channel itself is lined with granite, with five low bridges over it, limiting upstream access to small boats.

There are seven untreated CSOs which discharge to the Fort Point Channel. The large CSO at the head of the channel (BOS070) is the terminus of the Roxbury and Dorchester Brook Conduits, which drain a large combined sewer tributary area. BOS070 is the largest untreated CSO and it dominates the impacts of CSOs in this receiving water segment. Overflows from the Union Park Pump Station are the predominant source of CSOs to BOS070, as the overflows to the Dorchester Brook Conduit are relatively small in comparison. Figure 3-2 presents the total pollutant load and the relative contributions to the load from CSO and stormwater for pollutants causing non-attainment of designated uses in Fort Point Channel. As indicated in Figure 3-2, no upstream or boundary sources were identified for this receiving water segment. Compared to stormwater, CSOs are the predominant source of fecal coliform bacteria for both the 1-year storm and the typical year. CSOs also contribute the majority of the BOD and nutrient loads for the 1-year storm and annually. Additional data on pollutant loads from CSO and stormwater sources are presented in Appendix A.

Description of CSO Alternatives

The CSO control alternatives evaluated in detail for this receiving water segment are summarized in Table 3-13, along with the water quality benefits as compared with future planned conditions, critical siting issues, and costs. Brief descriptions of the alternatives are presented below, and additional details on the recommended plan, coarse screening for BOS062 through BOS068, detention/treatment at the Union Park Pump Station, in-line storage in the Dorchester Brook Conduit, and consolidation/storage conduit for BOS072 and BOS073 are presented in Section Four.

Coarse Screening for BOS062 through BOS068; Detention/Treatment at the Union Park Pump Station; In-line Storage in the Dorchester Brook Conduit and Consolidation/Storage Conduit for BOS072 and BOS073. This alternative is the recommended plan. Manually cleaned coarse screens would be installed in the outfall conduits for BOS062 through BOS068, which are inactive in the three-month storm. The

**TABLE 3-13. COMPARISON OF RECOMMENDED PLAN AND OTHER
CONTROL ALTERNATIVES FOR FORT POINT CHANNEL**

Evaluation Criteria	Future Planned Conditions	Alternatives			
		Recommended Plan Deten./Treat. UPPS; In-line Storage, DBC; Consol./Stor. BOS072-073; Screen BOS062-068	Complete Sewer Separation	Screen/Disinf. UPPS; In-line Storage, DBC; Ser./Disinf. BOS072-073; Screen BOS062-068	In-Receiving Water Controls BOS070; Screen BOS072-073 Screen BOS062-068
Water Quality Benefit (1)					
• Boating (Bacteria Std. Exceedance, hrs.)	19.7	0	0	0	19.7
• Swimming (Bacteria Std. Exceedance, hrs.)	40.4	23.8	23.8	23.8	40.4
• Aesthetics (Untreated CSO vol., MG)	27.75	0.22	0	0.22	27.75
• Aquatic Life (Dissolved Oxygen - BOD Load, lbs.) (Solids Load, lbs.)	24,200 44,200	20,550 36,360	22,480 43,200	22,250 39,260	24,200 42,580
• Performance (Untreated Overflows, no./yr.) (Closure of CSOs)	40 -	4 - 7 0	0 7	4 - 7 0	40 0
Critical Siting Concerns		Impacts on parking and housing adjacent to UPPS	Local street closings during construction	Impacts on parking and housing adjacent to UPPS	Aesthetic impact from receiving water controls
Capital Cost (millions)		\$26.1	\$249.8	\$12.7	\$2.5
Annual O & M Cost		\$1,376,357	\$0	\$923,496	\$352,397

1. The following notes apply to the measures of water quality benefit:

- Bacteria standard exceedance hours, untreated CSO volume, nutrient and solids loads are derived based on a 1-year storm event.
- The bacteria standards applied are for fecal coliform, as follows: boating, 1000/100ml; swimming 200/100ml.
- The duration of the simulation period was 99.4 hours.
- Nutrient load is from stormwater and CSO; solids load is from stormwater, CSO, and upstream boundary, if applicable.
- The number of untreated overflows per year is based on expected performance in a typical rainfall year.
- The closure of CSOs represents the number of CSO outfalls that could be permanently closed.

existing Union Park Pump Station would be upgraded to provide detention, disinfection and dechlorination of overflows. A hydraulic gate and pumpout facility would be constructed near the downstream end of the Dorchester Brook Conduit, returning captured overflows to the New Boston Main Interceptor following the end of the storm. A consolidation conduit between BOS072 and BOS073 would have sufficient capacity to capture 3 month storm overflow volumes. A pumpout station would be provided to return stored volumes to the South Boston Interceptor North Branch.

Complete Sewer Separation. This alternative would involve separation of combined areas tributary to the New Boston Main Interceptor and the South Boston Interceptor/North Branch. It should be noted that the Union Park Pump Station was constructed to alleviate flooding during rain storms. Stormwater must be pumped to the Fort Point Channel during high tide.

Coarse Screening for BOS062 through BOS068; Screening Disinfection at the Union Park Pump Station; In-line Storage in the Dorchester Brook Conduit, Screening and Disinfection for BOS072 and BOS073. This alternative would involve installing manually cleaned coarse screens in the outfall conduits for BOS062 through BOS068. The screens would remove large objects from the overflows before being discharged to the Fort Point Channel. The Union Park Pump Station would be upgraded to provide disinfection and dechlorination. The Dorchester Brook Conduit would be modified to provide in-line storage, as described in the recommended plan. Screening and disinfection facilities would be constructed in the vicinities of BOS072 and BOS073. These facilities would provide flow through treatment for overflows at these outfalls.

Coarse Screening for BOS062 through BOS068, BOS072 and BOS073 and In-Receiving Water Controls for BOS070. This alternative would involve the installation of manually-cleaned bar racks at BOS062 through BOS068, BOS072 and BOS073, and devices to control floatables in the Fort Point Channel near the BOS070 outfall. The in-receiving water

controls at BOS070 would involve floating booms, trash nets, or similar technologies designed to retain or collect floatables.

DEEP TUNNEL ALTERNATIVES

In addition to the receiving water segment-specific alternatives described above, one regional and two area-wide alternatives involving deep-rock tunneling technology were carried forward in the evaluation process. Features of each of the tunnel alternatives are summarized in Table 3-14, and layouts of the tunnels are presented in Figures 3-10 to 3-12.

The layouts of the area-wide alternatives providing control of the three-month and one-year storms were based on the layout of the recommended plan from the 1990 CSO Facilities Plan. Essentially, CSOs in the Inner Harbor, Lower Charles River, and Dorchester Bay would be controlled by deep tunnel alternatives, while CSOs in the Alewife Brook, Upper Charles, and Neponset River would be controlled locally by near-surface alternatives. If upstream CSOs within the areas to be controlled by a tunnel had zero or very low CSO volume at the design condition, the tunnel and/or consolidation conduits would not be extended upstream to those CSOs, and local CSO controls would be applied. Other assumptions used in developing the tunnel alternatives are detailed in the MWRA's June, 1994 report titled "Alternatives for CSO Control."

Table 3-15 summarizes the comparison of the tunnel alternatives against the recommended alternative for each receiving water segment. For areas not addressed by the area-wide tunnels, it is assumed that a similar level of control would be provided by local alternatives. For the areas not addressed by the Charles River Tunnel, it is assumed that the recommended receiving water-specific alternative would be implemented. The costs for the tunnel and non-tunnel areas are presented in Table 3-15, along with a comparison of the relative impacts on water quality.

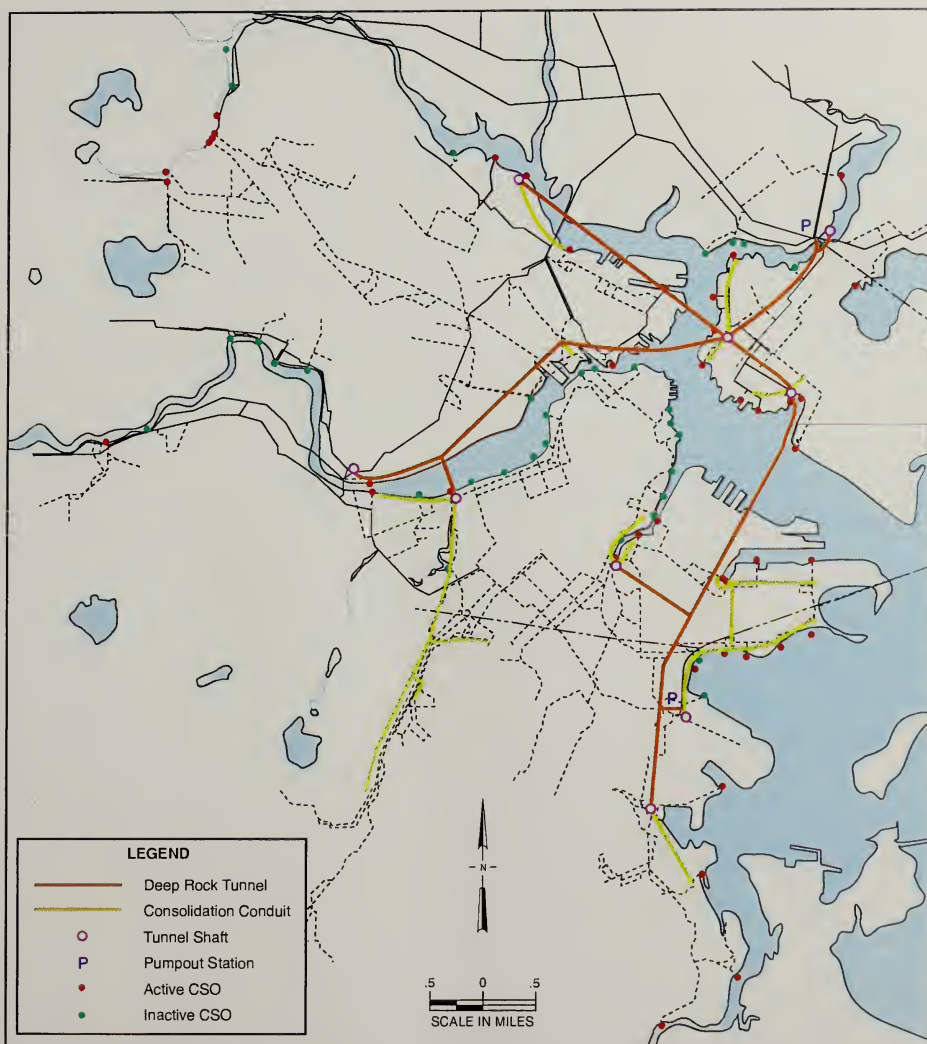


FIGURE 3-10. CSO TUNNEL PLAN FOR 3-MONTH STORM

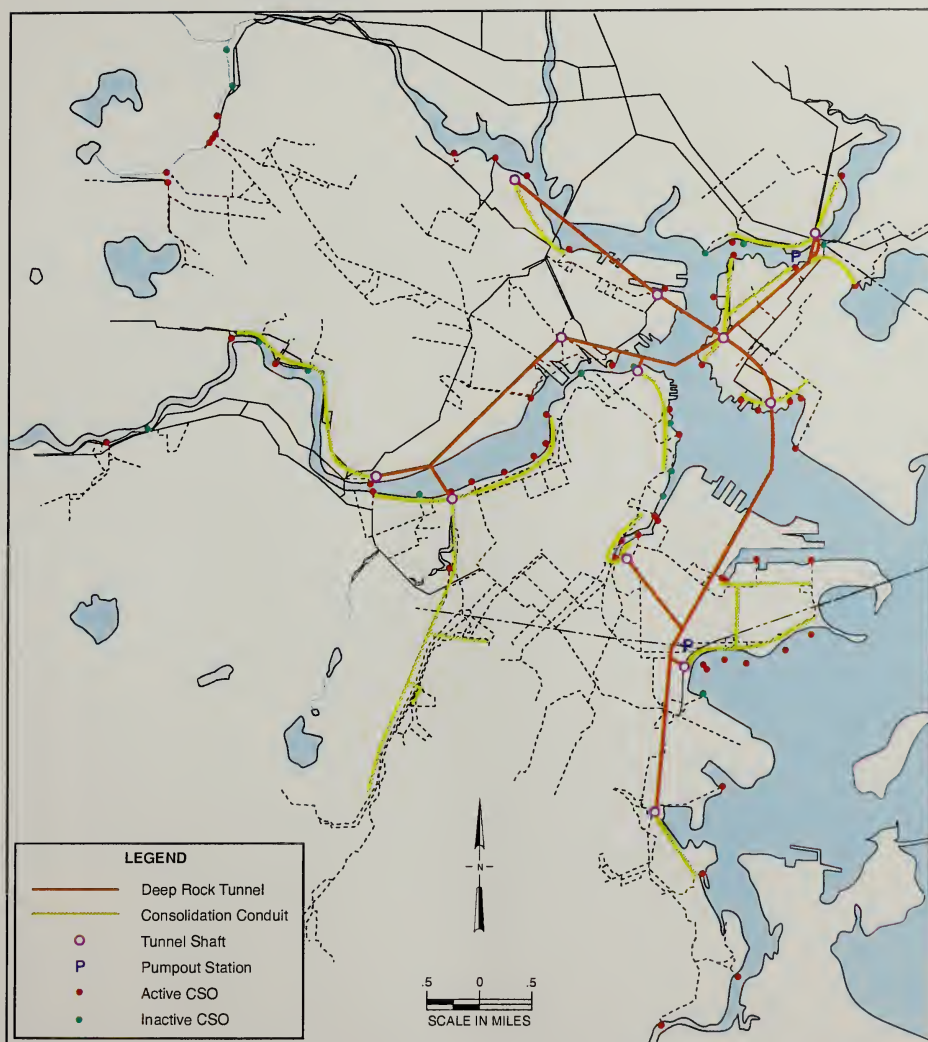
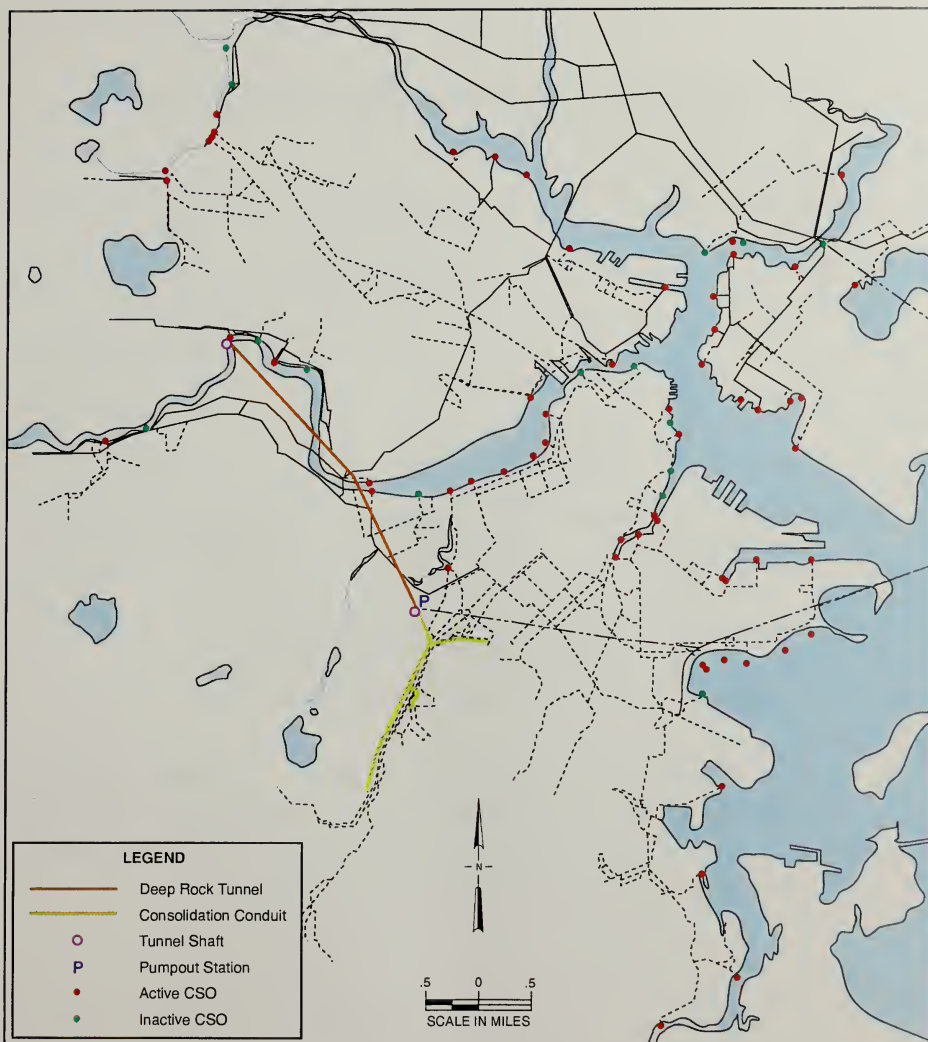


FIGURE 3-11. CSO TUNNEL PLAN FOR 1-YEAR STORM



**FIGURE 3-12. CSO TUNNEL PLAN FOR CHARLES RIVER,
1-YEAR STORM**

TABLE 3-14. DESCRIPTION OF CSO TUNNEL ALTERNATIVES⁽¹⁾

Description	3-Month	1-Year	1-Year Charles
Tunnel Diameter, Ft.	10	19	20
Tunnel Length, Ft.	74,000	74,000	18,000
Tunnel Volume, MG	41	155	40
Consolidation Conduit Volume, MG	20	28	7
Total Volume, MG	61	183	47
Pump-out Station	15N ⁽²⁾	50N	25
Capacity, MGD	15S ⁽²⁾	50S	
Active CSOs Not Controlled (Within Tunnel Alternative Coverage)	SOM007A ⁽³⁾ MWR207	SOM007	MWR010 MWR018 to MWR022

- Notes:
1. Refer to Figures 3-10 to 3-12, which illustrate these alternatives.
 2. N = North and S = South, refer to Figures.
 3. By providing tunnel control at MWR205 (outfall from Somerville Marginal CSO Facility), discharges will not occur at SOM007A.

As indicated in Table 3-15, the area-wide tunnel alternatives would provide a lower level of control in the critical use areas of Dorchester Bay and Constitution Beach, and would generally provide a higher level of control in the other receiving waters with the exception of Alewife Brook. As indicated in the series of tables comparing water quality impacts of alternatives by receiving water segment presented earlier in this section, however, it is apparent that providing a higher level of CSO control in non-critical use areas does not result in substantial improvements in water quality.

Given that the substantial additional costs of the tunnel alternatives did not provide significant improvements in water quality over the receiving water specific recommended alternatives, and in fact provided a lower level of control in critical use areas, none of the tunnel alternatives were recommended for implementation.

**TABLE 3-15. COMPARISON OF TUNNEL ALTERNATIVES
WITH RECOMMENDED PLAN**

Receiving Water Segment	Area-Wide Tunnel, 3-Month	Area-Wide Tunnel, 1-Year	Charles River Tunnel 1-Year	Recommended Plan
North Dorchester Bay	--	--	0 \$79	\$79
South Dorchester Bay	--	--	0 \$95	\$95
Neponset River	-- \$2	-- \$15	0 \$11	\$11
Constitution Beach	-- \$1	-- \$6	0 \$9	\$9
Upper Charles	+ \$1	+ \$9	+	\$5
Lower Charles	+	+	+	\$31
Back Bay Fens	+	+	+	\$0
Alewife Brook	0 \$3	0 \$32	0 \$3	\$3
Upper Mystic	0	+	0 \$0	\$0
Upper Inner Harbor	+	+	0 \$22	\$22
Lower Inner Harbor	+	+	0 \$20	\$20
Mystic/Chelsea ⁽¹⁾	+ \$2	+ \$2	0 \$32	\$32
Reserved Channel	+	+	0 \$41	\$41
Fort Point Channel	+	+	0 \$26	\$26
Cost for Tunnel, only	\$991	\$1,251	\$388	\$0
TOTAL COST	\$1,000	\$1,315	\$726	\$374

Key:



= Area is addressed by tunnel.

--

= Tunnel plan provides lower level of control than recommended plan.

0

= Tunnel plan provides same level of control as recommended plan.

+

= Tunnel plan provides higher level of control than recommended plan.

\$X

= Cost in \$ million for local control alternative for area not addressed by tunnel.

Note (1) Interceptor relief at Chelsea outfalls CHE002 to CHE004, at a cost of \$2 million, is required in addition to tunnel.

The tunnel alternatives were, however, also evaluated as potential means for providing equalization of flows to the Deer Island WWTP. Under this concept, also known as "peak shaving", additional storage capacity would be provided in the tunnels, such that flows to Deer Island above a given design peak would be diverted into the tunnels. If the design peak were set at the capacity of two batteries of secondary treatment, then it would be possible to eliminate the third battery. In evaluating the peak shaving alternative, the cost to provide sufficient additional tunnel storage and pump-out capacity to allow the elimination of the third battery of secondary treatment was found to be approximately \$200 million greater than the cost to provide the third battery. Since peak shaving was therefore clearly not cost effective, it was not evaluated further.

SECTION FOUR

SUMMARY OF THE RECOMMENDED PLAN

This section presents descriptions of the currently-recommended alternatives for each receiving water segment. These alternatives were selected based on the evaluation process presented in Section Two. Following submittal of this draft report, the recommended alternatives will be presented to the public in a series of community meetings. Based on comments from the public as well as from regulatory agencies and other interested parties, certain recommended alternatives may be modified or replaced with other alternatives. In general, the combination of receiving water-specific alternatives presented below provides varying levels of control cost-effectively matched to the current status of use attainment and sources of non-attainment within the receiving water segments.

A comparison of the impact of the recommended plan on annual activation frequencies and volumes for treated and untreated discharges is presented in Table 4-1. As indicated in this table, the recommended plan is predicted to reduce annual untreated overflow volumes by over 90 percent, and treated overflows by over 15 percent. Equally substantial reductions will be achieved in annual activation frequencies. Receiving water modeling output predicting the hours of violation of fecal coliform bacteria standards for varying levels of CSO control during the one-year storm are presented in Figures 4-1 to 4-4. Figures 4-1 to 4-3 present the hours of violation of the restricted shellfishing standard (88 counts/100 ml), the swimming standard (200 counts/100 ml), and the boating standard (1,000 counts/100 ml), respectively, for 16 locations in the Boston Harbor, Constitution Beach, and Dorchester Bay basins. Figure 4-4 presents the hours of violation of the boating standard for five locations in the Charles River basin. The swimming standard is exceeded by non-CSO sources at all five locations in the Charles River for the duration of the simulation period, which is 99.4 hours for all simulations. Figure 4-5 shows the locations of the receiving water modeling output data presented in Figures 4-1 to 4-4. These figures will be referenced in more detail in the discussion of the recommended alternatives below. The recommended plan is summarized in Table 4-2.

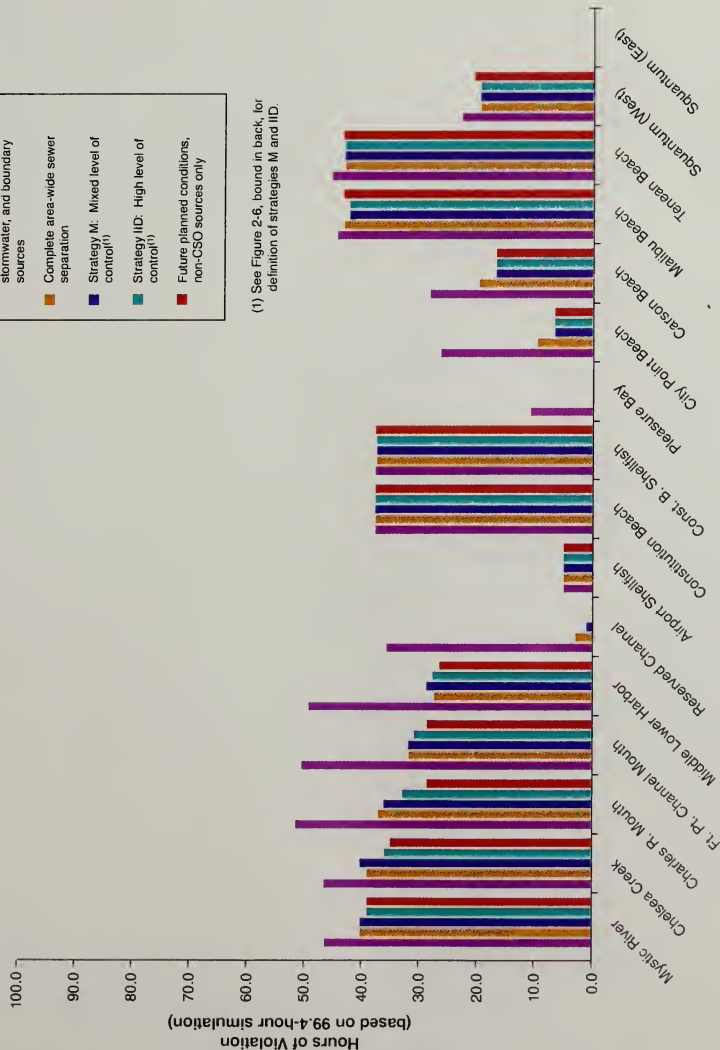
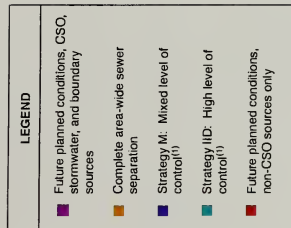
TABLE 4-1. CSO VOLUMES AND ACTIVATIONS FOR TYPICALIZED YEAR

OUTFALL	FUTURE PLANNED CONDITION				RECOMMENDED PLAN			
	CSO VOLUME (MG)		ACTIVATION FREQUENCY		CSO VOLUME (MG)		ACTIVATION FREQUENCY	
	TREATED	UNTREATED	TREATED	UNTREATED	TREATED	UNTREATED	TREATED	UNTREATED
ALEWIFE BROOK								
CAM 001		0.19		7		0.13		4
CAM 002		3.26		11		2.80		9
CAM 003		1.48		7		0.84		4
CAM 004		9.10		16		0.26		3
CAM 400		0.47		7		0.31		6
CAM 401		0.01		4		0.03		3
SOM 001A		0.40		7		0.25		4
SOM 002A		3.36		7		2.29		4
SOM 003		0		0				
SOM 004		0.00		0		0.00		0
SOM 004		0.03		14		0.01		3
TOTAL		18.30				6.92		
UPPER MYSTIC RIVER								
SOM 007		0.04		2		0.01		1
SOM 007A	6.72		11		1.83		3	3
TOTAL	6.72	0.04			1.83	0.01		
MYSTIC / CHELSEA CONFLUENCE								
MWR 205 (Somerville Marginal)	99.95		32		26.18		31	
BOS 013		4.38		35		0.24		3
BOS 014		1.47		8	1.02		6	
BOS 015		plugged		plugged		plugged		plugged
BOS 017		2.53		18	2.33		14	
CHE 002		0.04		2		0.08		1
CHE 003		0.35		8		0.30		9
CHE 004		0.27		2		0.26		2
CHE 008		8.32		8	0.45		2	
TOTAL	99.95	17.36			29.98	0.88		
UPPER INNER HARBOR								
BOS 009		3.94		34		0.53		5
BOS 010		8.34		35		1.34		5
BOS 012		6.65		36		0.49		5
BOS 019		3.61		18	1.34		6	
BOS 050		0.00		1		0.03		1
BOS 052		plugged		NA		plugged		NA
BOS 057		0.38		5		0.66		1
BOS 058		plugged		NA		plugged		NA
BOS 060		2.53		4		1.28		4
MWR 203 (Prison Point)	196.68		21		239.15		25	
TOTAL	196.68	25.45			240.49	4.33		
LOWER INNER HARBOR								
BOS 003		3.20		13		4.41		5
BOS 004		4.17		23		0.20		2
BOS 005		0.06		4		0.00		0
BOS 006		1.18		14		0.05		1
BOS 007		4.26		29		0.27		5
TOTAL		12.87				4.93		
CONSTITUTION BEACH								
MWR 207	1.35		16		0.00		0	
TOTAL	1.35	0.00			0.00	0.00		
FORT POINT CHANNEL								
BOS 062		0.00		0		0.23		1
BOS 064		0.04		5		0.02		2
BOS 065		0.15		1		0.11		1
BOS 068		0.00				2.40		7
BOS 070		160.05		4	49.25		12	
BOS 072 & BOS 073		7.44		23		1.68		2
TOTAL		167.68			49.25	4.44		
RESERVED CHANNEL								
BOS 076 to BOS 080		66.53		44	13.06		6	
TOTAL		66.53			13.06			
NORTHERN DORCHESTER BAY								
BOS 081 to BOS 087		9.03		78		0.00		0
TOTAL		9.03				0.00		

TABLE 4-1. CSO VOLUMES AND ACTIVATIONS FOR TYPICALIZED YEAR

OUTFALL	FUTURE PLANNED CONDITION				RECOMMENDED PLAN			
	CSO VOLUME (MG)		ACTIVATION FREQUENCY		CSO VOLUME (MG)		ACTIVATION FREQUENCY	
	TREATED	UNTREATED	TREATED	UNTREATED	TREATED	UNTREATED	TREATED	UNTREATED
SOUTHERN DORCHESTER BAY								
BOS 088		0.01		1		0.00		0
BOS 089 CSOs (1)	34.97		22			0.12		6
Fox Pt.	57.72		86			90.06		44
BOS 090 CSOs	5.34		14			0.13		1
Comm. Pt.	110.59		86			283.30		29
TOTAL	168.32	0.01			0.25	0.00		
UPPER CHARLES								
BOS 032		1.92		10	1.86		10	
BOS 033		0.07		5		0.05		3
CAM 005		17.14		4	3.77		11	
CAM 007		0.78		1		0.79		1
CAM 009		0.13		12	0.22		1	
CAM 011		0.07		1		0.07		1
TOTAL		20.11			5.85	0.91		
LOWER CHARLES								
BOS 028		0.02		6		0.02		5
BOS 042		0.00		0		0.00		0
BOS 049		0.00		0		0.00		0
CAM 017		4.79		6		1.43		2
MWR 010		0.00		0		0.00		0
MWR 018		2.25		2		1.27		2
MWR 019		1.00		2		0.41		2
MWR 020		0.53		3		0.20		2
MWR 021		0.42		2		0.13		2
MWR 022		0.37		2		0.09		2
MWR 201 (Cottage Farm)	127.99		22		116.05		21	
MWR023 CSO's		76.31		30	41.14		26	
OUTFALL		1288.14		NA	1296.12		NA	
SOM 010		0.12		1		0.02		1
TOTAL	127.99	85.81			157.19	3.57		
NEPONSET RIVER								
BOS 093		1.21		11		0.00		0
BOS 095		4.58		17		0.00		0
TOTAL		5.79				0.00		
BACK BAY FENS								
BOS046 (2)		4.91		2		5.14		2
TOTAL		4.91				5.14		
GRAND TOTAL	601.00	433.89			497.90	31.13		

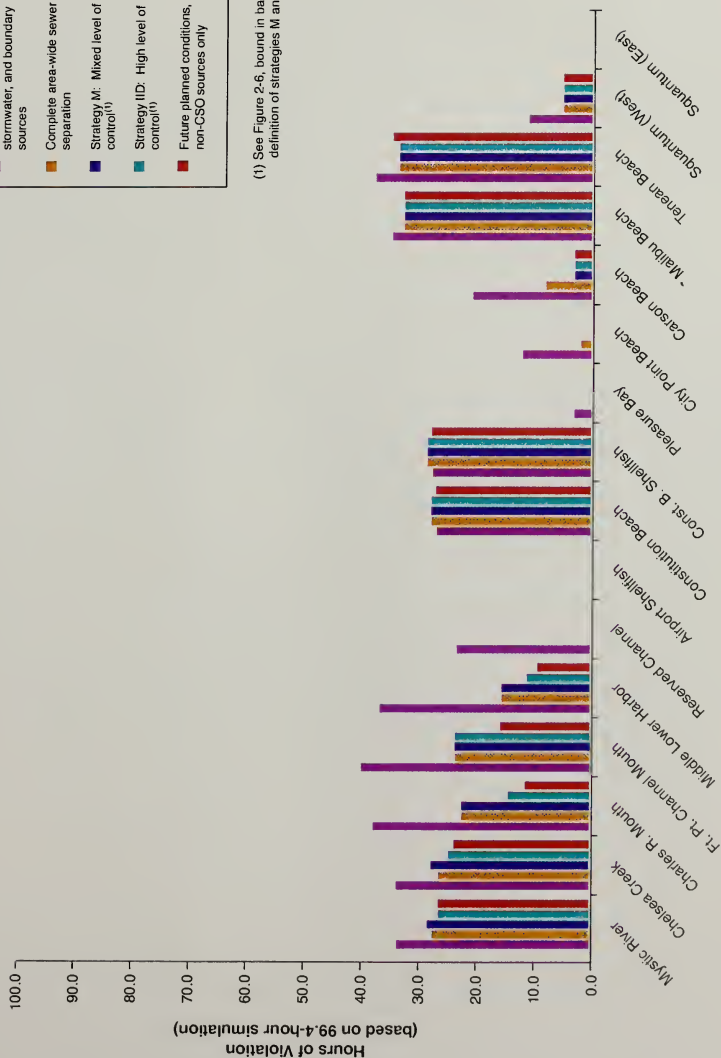
- (1) Stormwater and CSOs are flowing into the interceptor system during high tide.
 (2) Stormwater and CSOs overtopping weir at Gatehouse 1.



(1) See Figure 2-6, bound in back, for definition of strategies M and IID.

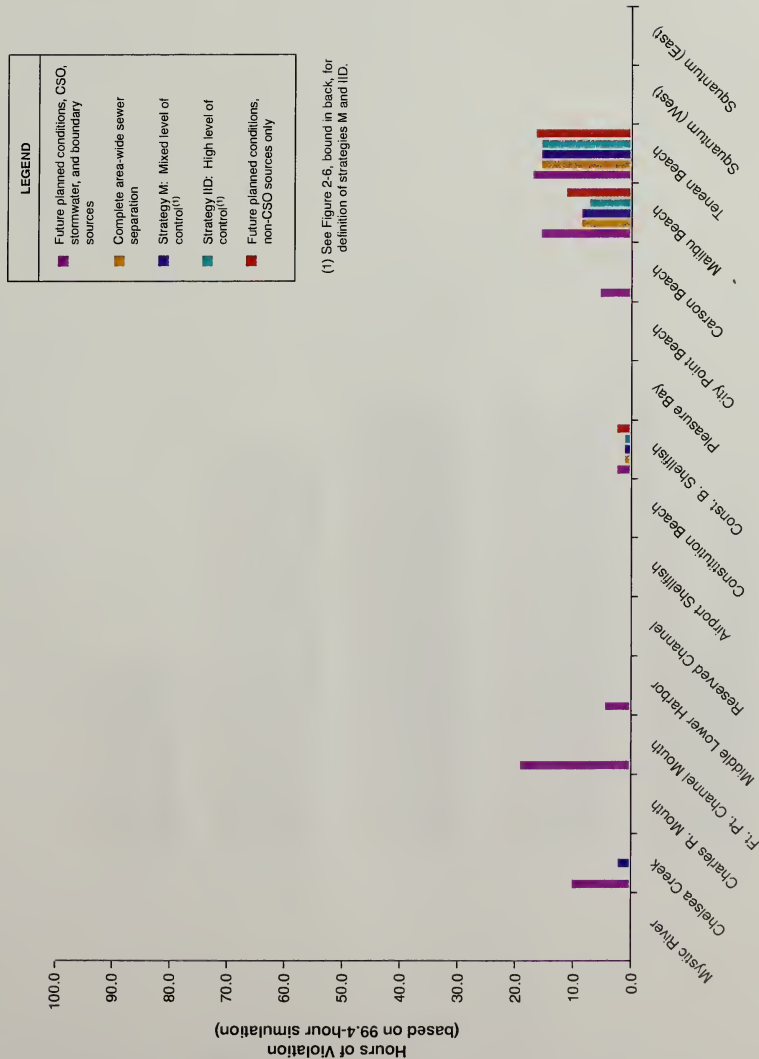
FIGURE 4-1. BOSTON HARBOR, VIOLATIONS TO SHELLFISHING STANDARD OF 88 COUNTS/100ml

LEGEND	
■	Future planned conditions, CSO, stormwater, and boundary sources
■	Complete area-wide sewer separation
■	Strategy Mt: Mixed level of control ⁽¹⁾
■	Strategy I/D: High level of control ⁽¹⁾
■	Future planned conditions, non-CSO sources only



(1) See Figure 2-6, bound in back, for definition of strategies Mt and I/D.

FIGURE 4-2. BOSTON HARBOR, VIOLATIONS TO SWIMMING STANDARD FROM ONE-YEAR STORM



(1) See Figure 2-5, bound in back, for definition of strategies M and IID.

FIGURE 4-3. BOSTON HARBOR, VIOLATIONS TO BOATING STANDARD DURING ONE-YEAR STORM

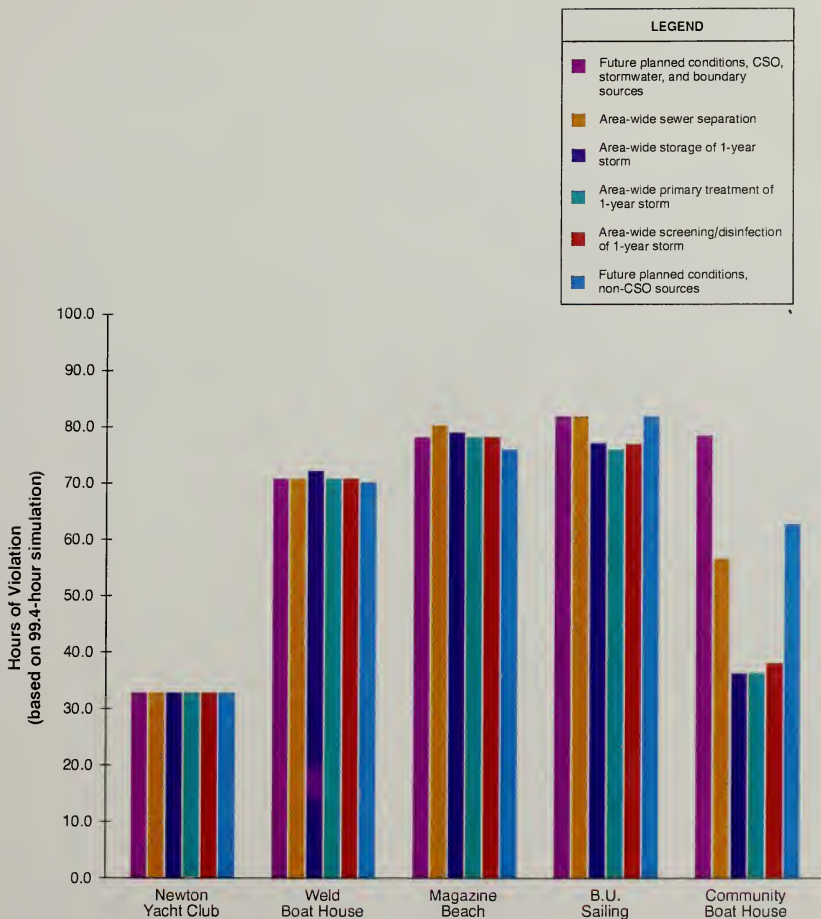


FIGURE 4-4. CHARLES RIVER, VIOLATIONS TO BOATING STANDARD



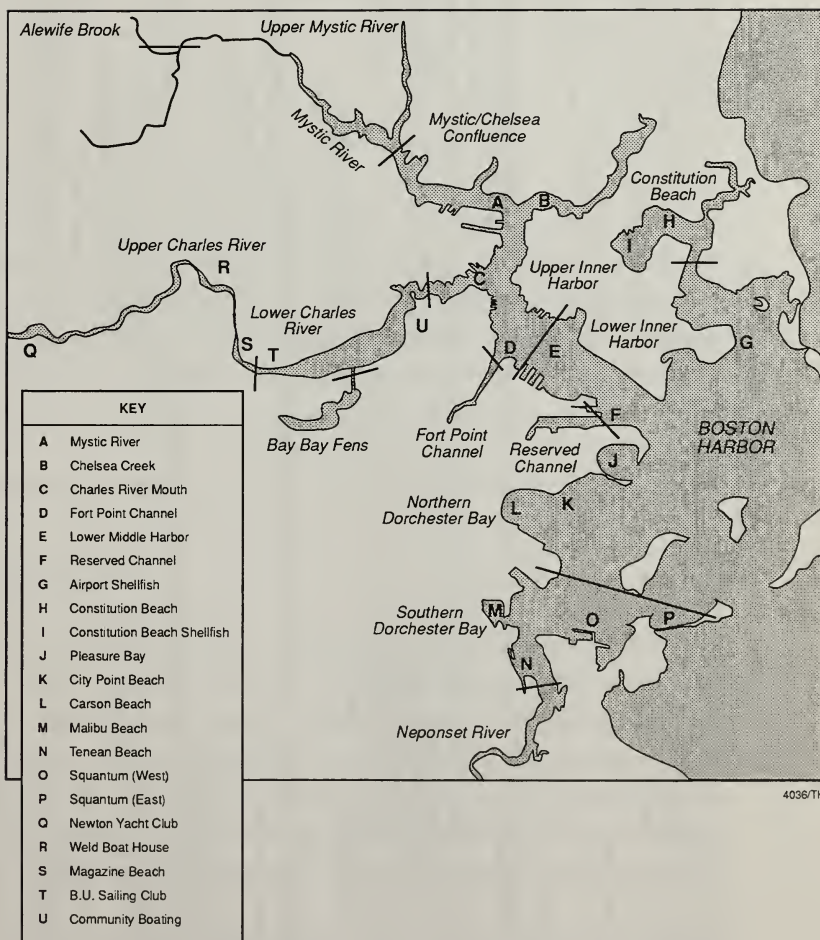


FIGURE 4-5. LOCATIONS FOR RECEIVING WATER MODELING OUTPUT

TABLE 4-2. RECOMMENDED CONCEPTUAL CSO CONTROL PLAN
Critical Use Area In Parentheses

Basins	Level of Control	Recommended Plan	Annual CSO Activation Frequency (1)			Reasons/Comments	Capital Cost (million \$) (2)	
			Ful. Planned Conds.	Unreated	Recommended Plan			
Dorchester Bay N. Dorchester Bay (Swimming/Shellfishing)	I	CSO relocation to Reserved Channel	78	78	0	1. Eliminates CSOs to North Dorchester Bay, potential for SA designation 2. Relocated flow to Reserved Channel to receive screening and disinfection	\$79	
S. Dorchester Bay (Swimming/Shellfishing)	I	Sewer separation	22	1	0	1. Eliminates CSOs, potential for SA designation 2. Interim upgrade of existing facilities 3. Potential for use of Fox and Commercial Point CSO facilities for stormwater treatment by others	\$95	
Neponset River (Shellfishing)	I	Sewer separation	17	17	0	1. Eliminates CSOs 2. Requires separation of South Dorchester area also	\$11	
Constitution Beach (Swimming/Shellfishing)	I	Sewer Separation	16	0	0	Subtotal - Neponset River/Dorchester Bay Subarea: \$9 1. Eliminates CSOs potential for SA designation 2. Critical use area, potential for use of CSO Facility for stormwater treatment by others.	\$165	
Subtotal - Constitution Beach Subarea: \$9							\$9	
Charles River								
Upper Charles River	II	Screening and disinfection at individual CSOs in Boston and Cambridge (BOS002,CAM005,009)	10	10	11	0	1. High recreational uses; heavy stormwater impact on Charles River 2. Reconsider after watershed planning, separation cost of \$60 million	\$5
Lower Charles River - Cottage Farm	II	Upgrade of Cottage Farm CSO Facility with finer screens, effluent diffuser, upgrade chlorination, provide dechlorination	22	0	21	0	1. High recreational use; heavy stormwater impact on Charles River	\$7
- Stony Brook	II	Screening and disinfection facility at Charlesgate guideway at Stony Drive	30	30	26	0	1. Heavy stormwater impacts on Charles River 2. Treats stormwater and CSO from Stony Brook basin 3. Reconsider after watershed planning with State	\$24
Back Bay Fens	II	Screening at outfall	2	2	2	2	1. Consistent with water quality goal	\$56
Alewife/Upper Mystic Alewife Brook	II	Separate CAM004 Area	16	16	9	9	Subtotal - Charles River Subarea: \$3 1. 4-7 overflows per year; large stormwater impacts 2. Reevaluate in conjunction with watershed planning by state	\$3
Upper Mystic River	II	Separation of bottle manholes Continue treatment at Somerville Marginal CSO Facility (BOM007A)	11	2	3	0	1. Large stormwater impacts 2. No WQ benefit for higher controls	\$0.1
Boston Harbor							Subtotal - Alewife/Upper Mystic Subarea: \$3	\$3
Upper Inner Harbor	II	Relieve E. Boston Branch sewer Upgrade east Prison Point CSO Facility (dechlorination) New - surface storage for Charlestown BOS019	36	36	25	5	1. 4-7 overflows per year from E. Boston and BOS019; industrial/shipping water uses 2. Allows full use of Cause Pump Station capacity 3. Large impacts from stormwater and Charles R. discharge	\$22
Lower Inner Harbor	II	Relieve E. Boston Branch sewer	29	29	5	5	1. 4-7 overflows per year from E. Boston	\$20
Mystic/Chelsea	II	Screening/disinfection facilities at BOS014,017, CHE008 Storage at relocated Somerville Marg. CSO Facility Interceptor relief, CHE002-CHE004	35	35	14	9	1. Industrial/shipping water uses and Mystic R. discharge impacts 2. Dissolved oxygen deficient near existing Som. Marginal facility outfall	\$32
Reserved Channel	II	Regional screening/disinfection facility (joint with N. Dorchester Bay)	44	44	6	0	1. High commercial/industrial use 2. Receives relocated CSO from N. Dorchester Bay	\$41
Fort Point Channel	II	Detention treatment facility at Union Park P.S. Consolidation storage at 072/073 Coarse screens at 050 to 068 In-line storage in Dorchester Brook conduit	23	23	12	7	1. Separation infeasible; aesthetics important 2. High commercial / industrial use	\$26
Subtotal - Boston Harbor Subarea: \$141							\$141	
(1) For receiving water segments with multiple CSO outfalls, activation frequency is for the most active outfall tributary to the receiving water segment. (2) Capital cost includes engineering, construction and contingency.							Total - All Subareas: \$374	

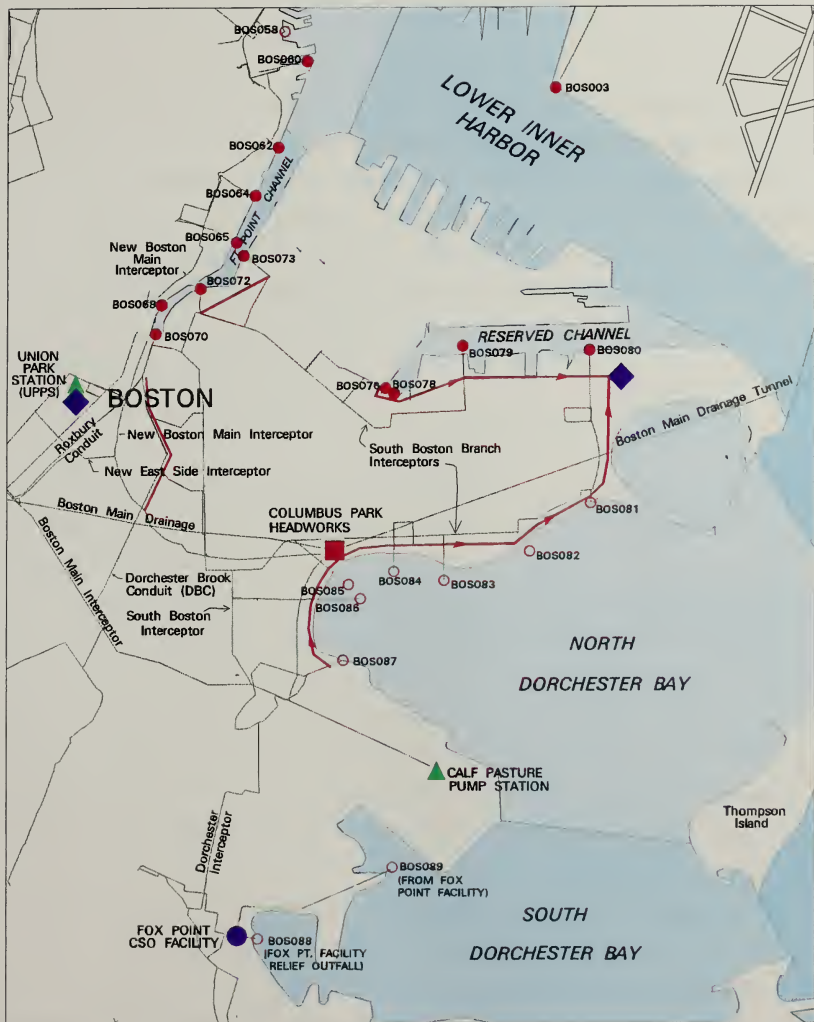
In reviewing the water quality benefits of the recommended plan, it must be remembered that the CSO control alternatives described herein represent only part of the MWRA's ongoing CSO control program. Since 1988, the MWRA has already invested over \$200 million in CSO-related system improvements. These improvements, which included increasing the transport capacity to Deer Island, rehabilitating existing CSO control facilities, and guiding three new CSO screening and disinfection facilities, have already resulted in a 55-percent reduction in annual overflow volume since 1988. Currently, 50-percent of remaining annual overflow volumes receive at least screening and disinfection treatment. As ongoing system optimization plans and other improvements to Deer Island are completed, by 1997 the annual CSO volume will have been reduced by 70 percent over 1988, with approximately 60 percent receiving at least screening and disinfection. With implementation of the recommended CSO control alternatives, the reduction in annual overflow volume over 1988 will be almost 85 percent, with almost 95 percent of remaining overflow volume receiving at least screening and disinfection.

DORCHESTER BAY BASIN

North Dorchester Bay

Swimming and shellfishing have been identified as critical uses for this waterbody. Consistent with the Massachusetts CSO policy regarding critical use areas, and the USEPA CSO policy regarding sensitive areas, the preferred alternative for North Dorchester Bay is to eliminate the CSOs through relocation to a less sensitive area (the Reserved Channel). A consolidation conduit sized to carry the maximum flow that could be passed through the outfalls would run parallel to Carson Beach from outfall BOS087 to BOS081, then to a screening, disinfection, and dechlorination facility constructed near BOS080 (Figure 4-6).

The consolidation conduit for outfalls BOS081 to BOS087 would range in size from approximately 48-in. to 96-in. diameter, and would likely be installed by soft-ground tunneling. The conduit would have sufficient volume to store overflows from the one-year



LEGEND

- Existing Conduit
- Proposed Conduit
- ▲ Pump Station
- CSO Treatment Facility
- ◆ Proposed CSO Facility
- Headworks
- CSO Outfall
- Eliminated CSO Outfall

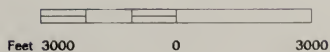


Figure 4-6

Reserved Channel
Fort Point Channel
North Dorchester Bay
Recommended Plan

storm from outfalls BOS081 to BOS087. The screening/disinfection facility, located at either Conley Marine Terminal or at other industrial parcels along the waterfront, would have pumping facilities to discharge screened and disinfected flows to the mouth of the Reserved Channel, as well as to dewater the conduit to the SBI South Branch. This facility would also serve the consolidation conduit collecting CSOs located along the Reserved Channel. Once the new facilities are in place, outfalls BOS081 through BOS087 would be bulkheaded. The impacts of this alternative on water quality in the Reserved Channel appear to be relatively minor, as the recommended water quality goals for that receiving water segment are achievable with the recommended plan (see discussion of Reserved Channel below).

Water Quality Impacts. CSO relocation was preferred over sewer separation because the cost was about the same, and sewer separation would introduce additional stormwater to the receiving water. With the elimination of the CSOs, the major remaining source of pollutants causing non-attainment of uses in this receiving water segment would be stormwater. For example, as indicated in Figures 4-1 to 4-3, non-CSO sources are still predicted to cause violations of the restricted shellfishing standard at City Point and Carson Beaches, and brief (less than five hours) violations of the swimming standard at Carson Beach during the one-year storm. The boating standard would be met at both beaches. Elimination of CSOs will, however, reduce the risk of contact with human pathogens, and will enable achievement of designated uses should the non-CSO sources be controlled at some point in the future.

Siting Issues. The consolidation conduit would be located under Day Boulevard, Carson Beach, or parts of both. Surface disruptions would be minimized by soft-ground tunneling, although access shafts would be required. Restriction of construction activities during the swimming season could mitigate some impacts on the beach areas, but would also prolong the overall construction period. Sufficient space for the screening/disinfection facility appears to be available at or near the Conley Marine Terminal. One concern with this location would be the potential for encountering contaminated soil, as well as the proximity of underground fuel storage tanks. Short-term construction impact would include disruptions to traffic and beach use, as well as noise and dust impacts on residences along Day

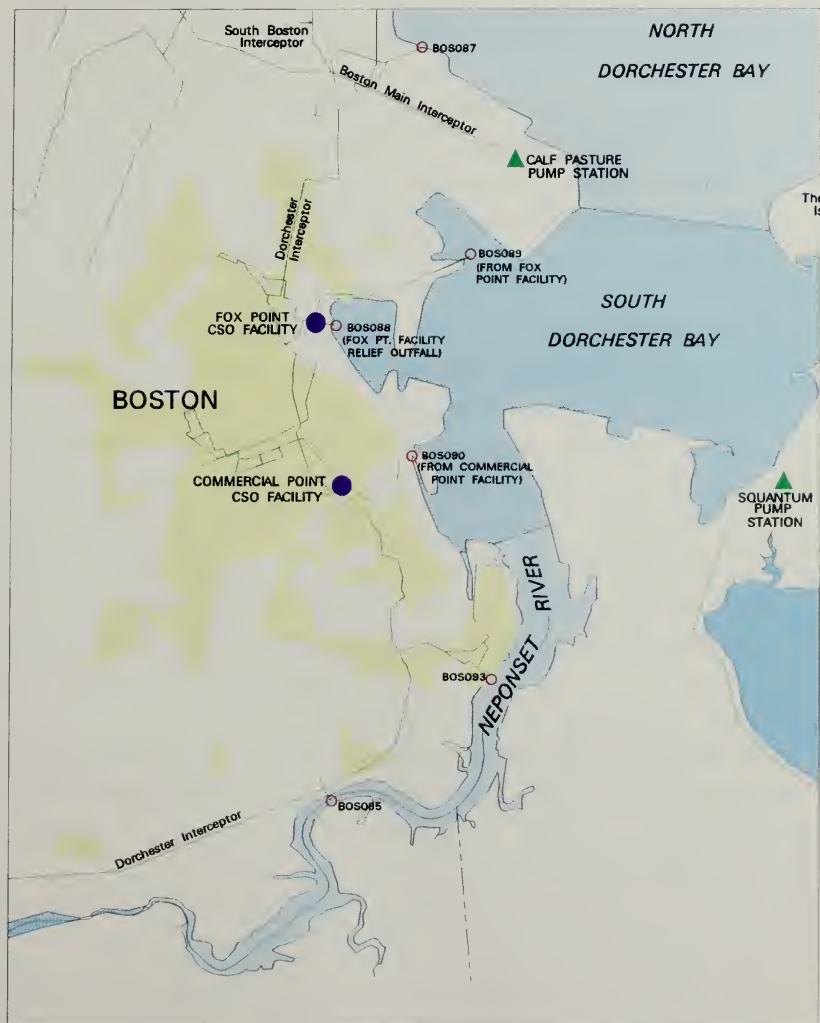
Boulevard and Farragut Street. Long-term community impacts would be minimal, assuming the facility could be located at the industrial waterfront areas.

Costs. The capital cost for this alternative is estimated at \$79 million, with annual O&M costs of approximately \$250,000. Total present worth as of December, 1995 would be \$65 million.

South Dorchester Bay

Similar to North Dorchester Bay, swimming and shellfishing have been identified as critical uses in South Dorchester Bay. The preferred alternative involves upgrading the existing screening and disinfection facilities at Fox Point and Commercial Point to provide dechlorination, and implementing a sewer separation program which would ultimately eliminate the CSOs. The general location of the separation work, covering approximately 706 acres, is presented in Figure 4-7. Adding dechlorination to the existing facilities would be a relatively easy-to-implement, low-cost project which would provide the short-term benefit of lowering effluent chlorine residuals, and reducing impacts on shellfish resources. The separation program would target the major combined sources first, while distributing the financial burden of the project over a number of years. Upon completion of the separation work, the existing facilities at Fox Point and Commercial Point would either be abandoned, or could potentially be used to treat the separate stormwater by those parties who are responsible for stormwater management.

Water Quality Impacts. As indicated in Figures 4-1 to 4-3, elimination of CSOs through sewer separation will not eliminate predicted violations to the restricted shellfishing, swimming, and boating standards at Malibu and Tenean Beaches. It is apparent that non-CSO sources are the primary cause of non-attainment at these locations. In the case of Tenean Beach in particular, it is likely that pollutant loads from the Neponset River contribute to non-attainment. The impacts of stormwater on these areas may be mitigated to some extent if the existing facilities at Fox and Commercial Point were to remain in



LEGEND

- Existing Conduit
- Pump Station
- CSO Treatment Facility
- Proposed CSO Facility
- Headworks
- CSO Outfall
- Eliminated CSO Outfall
- Proposed Sewer Separation



Feet 3000 0 3000

Figure 4-7
South Dorchester Bay
Neponset River
Recommended Plan

operation by others for stormwater treatment. Providing dechlorination and ultimately eliminating CSOs through sewer separation will, however, reduce the potential discharge of chlorine residuals to the bay, and in the long term reduce risk of contact with human pathogens. This alternative would then facilitate achievement of designated uses if in the future the non-CSO sources of pollutants are controlled.

Siting Issues. Installation of dechlorination equipment to the Fox and Commercial Point CSO Facilities may require additions to the existing structures, but the additional space required would not be substantial. The sewer separation work would involve open-cut excavations primarily in streets and existing rights-of-way. Short-term impacts of these projects would be limited to traffic disruptions and other local construction impacts as the separation work proceeds. These impacts would be spread over the entire phased implementation period, and would likely not be continuous. Long term impacts of separation as a CSO control measure would be negligible, however because this work will be phased over the entire 15-year implementation period, localized construction related disruptions could be considered a long-term impact.

Costs. The capital cost for this alternative is estimated at \$95 million, with annual O&M costs of approximately \$660,000 per year. Total present worth as of December, 1995 would be \$83 million.

Neponset River

Consistent with the approach taken in North and South Dorchester Bay to eliminate CSOs to critical use areas, elimination of CSOs through sewer separation was selected as the preferred alternative for the Neponset River. The general location of the sewer separation work, covering approximately 68 acres, is presented in Figure 4-7. Although the source of fecal coliform to this receiving water segment is predominantly stormwater and other upstream, non-CSO sources, sewer separation was an appropriate choice due to the critical uses in the Neponset River (shellfishing). In addition, the cost of sewer separation was less than some

of the storage alternatives, and would not require siting of new facilities along the river. Sewer separation would not have been appropriate at outfall BOS095 without the proposed separation project for South Dorchester Bay, since BOS095 would still activate in large storms due to surcharging in the Dorchester Interceptor.

Water Quality Impacts. With the elimination of CSOs, the primary sources of pollutants causing non-attainment of uses will be stormwater, for major rainfall events such as the one-year storm, and upstream flow on an annual basis. As described above, elimination of CSOs in this receiving water will not result in attainment of bacteria count-related designated uses at Tenean Beach and adjacent shellfish beds for the one-year storm. However, sewer separation would allow attainment of these uses if the non-CSO sources could be controlled. Separation would also reduce the risk of contamination from human pathogens. The Massachusetts EOE study of the Neponset River as a pilot for development of the Massachusetts Watershed Initiative may provide the framework for addressing the non-CSO sources of pollutants causing nonattainment of uses in the Neponset River.

Siting Issues. Sewer separation work would involve open cut excavations in streets and existing rights-of-way. Short-term impacts of this work would be limited to localized construction-related noise, dust, and disruptions to traffic, while long term site impacts would be negligible.

Costs. The capital cost for this alternative is estimated at \$11 million, with negligible incremental O&M costs. Total present worth as of December, 1995 would be \$9 million.

CONSTITUTION BEACH

Complete sewer separation upstream of regulator RE002-2 will eliminate the only source of CSO to this receiving water segment. The general location of the sewer separation work, covering approximately 37 acres, is presented in Figure 4-8. Since shellfishing and swimming have been identified as critical uses in this waterbody, the elimination of CSO



LEGEND

- Existing Conduit
- Proposed Conduit
- Pump Station
- CSO Treatment Facility
- Proposed CSO Facility
- Headworks
- CSO Outfall
- Eliminated CSO Outfall
- Proposed Sewer Separation



Figure 4-8
Constitution Beach
Lower Inner Harbor
Recommended Plan

justified the relatively small incremental cost of sewer separation over one-year storm control alternatives. The potential for future use of the existing Constitution Beach screening and disinfection facility by other responsible parties for treating separated stormwater was also identified.

Water Quality Impacts. As indicated in Figure 3-2, CSOs constituted a small fraction of the fecal coliform bacteria local to this receiving water segment, on the basis of individual storm events and as an annual load. Figures 4-1 to 4-3 indicate that the restricted shellfishing and swimming standards will continue to be exceeded at Constitution Beach during the one-year storm, due to non-CSO sources. Continuing to operate the Constitution Beach screening and disinfection facility as a stormwater treatment facility would mitigate to some extent the impacts of stormwater, however substantial volumes of stormwater enter this receiving water segment through other stormwater outfalls. By eliminating the CSO, however, the risk of contact with human pathogens in this sensitive area is reduced, and the opportunity is created to achieve designated uses should the stormwater sources ultimately be controlled.

Siting Issues. Sewer separation work would involve open cut excavations primarily in streets and existing rights-of-way. Short term impacts of this work would be limited to localized construction-related noise, dust, and disruptions to traffic, while long-term site impacts would be negligible.

Costs. The estimated capital cost for this alternative is \$9 million, with negligible incremental O&M costs. Total present worth as of December, 1994 would be \$7 million.

CHARLES RIVER BASIN

Upper Charles









The preferred alternative for this receiving water segment includes individual screening, disinfection, and dechlorination facilities at outfalls CAM005, CAM009, and BOS032 (Figure 4-9). Each facility would include mechanically-cleaned bar screens, storage tanks, pumps, and related chemical feed equipment for the disinfection and dechlorination systems, electrical equipment and controls, and truck access for delivery of chemicals and disposal of screenings. It may be possible to locate some of this equipment below grade. The facilities would be located in the outfall pipe, between the regulator and the shore of the Charles River. Screening and disinfection facilities at these locations would be smaller and less obtrusive than the tanks required to provide a higher level of control.

Water Quality Impacts. While the Upper Charles receives substantial recreational use, the proportion of pollutants, such as fecal coliform, BOD, TSS, and nutrients, contributed by CSOs is relatively small compared to stormwater and other non-CSO sources. From Table 3-2 and Figure 4-4, it is apparent that a higher level of control in this area would not result in significantly improved water quality, due to stormwater and upstream sources. In fact, the hours of violation of swimming and boating standards would not be impacted by complete elimination of CSO discharges to the Upper Charles. Disinfection of the CSOs would, however, help to reduce the risk of contact with human pathogens. Additional controls by the MWRA could become appropriate in the Upper Charles in the future, pending completion of comprehensive watershed planning and integration with substantial control of stormwater and other non-CSO pollution sources by other parties.

Siting Issues. The facility for BOS032 could potentially be located at the corner of North Beacon and Parsons Streets, while siting of facilities for CAM005 and CAM009 will be more challenging. The facility for CAM005 could be located next to a children's playground along Mount Auburn Street, however it may also be possible to locate the facility further



LEGEND

-  Existing Conduit
-  Proposed Conduit
-  Pump Station
-  CSO Treatment Facility
-  Proposed CSO Facility
-  Headworks
-  CSO Outfall
-  Eliminated CSO Outfall

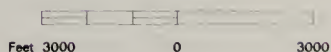


Figure 4-9
Upper Charles
Recommended Plan

upstream along the Charles River. Sites located away from the existing CAM005 outfall would require additional pipe installation and potentially a new outfall, which are not included in the current cost estimate.

A potential site for the CAM009 facility would be within John F. Kennedy Park. As with the CAM005 facility, however, alternative sites may be available in locations not directly along the CAM009 outfall pipe. In addition, the data suggest that it may be appropriate to consider providing only manually-cleared bar racks at CAM009. This equipment could be installed in a manhole structure completely below grade.

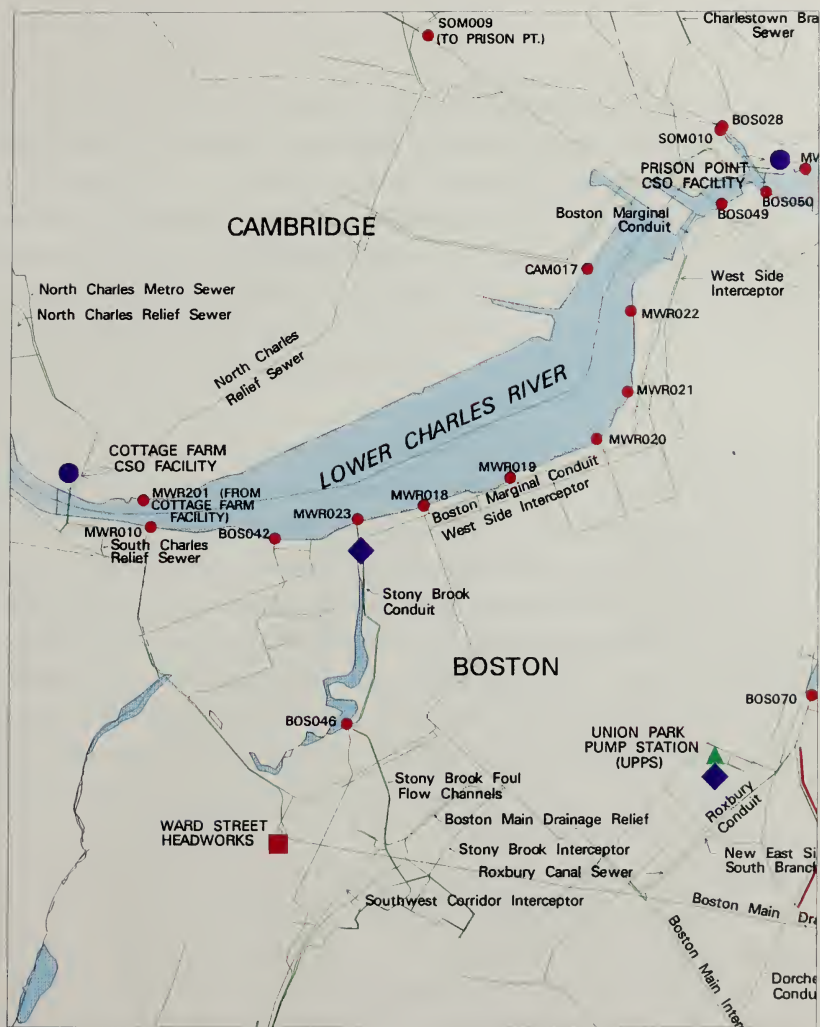
Short term impacts of these facilities would include construction-related noise, dust, and traffic impacts. Traffic impacts along Memorial Drive and noise impacts on Mount Auburn Hospital may be significant.

While use of the children's playground and John F. Kennedy Park would be impaired if these sites are selected. Long term site impacts would primarily involve a moderate increase in truck traffic associated with facility operation. Aesthetic impacts of the buildings could be mitigated through architectural treatments.

Costs. The estimated capital cost for this alternative is \$5 million, with approximately \$140,000 per year in annual O&M costs. Present worth as of December, 1995 would be \$5.5 million.

Lower Charles

The preferred alternative for this receiving water segment involves providing a screening, disinfection, and dechlorination facility on the Stony Brook Conduit, and upgrading the existing Cottage Farm CSO Facility with new effluent screens, an outfall diffuser, and dechlorination equipment (Figure 4-10). The Cottage Farm facility currently provides a modest level of BOD, TSS, and fecal coliform reduction, particularly during small storm



LEGEND

- Existing Conduit
- Proposed Conduit
- ▲ Pump Station
- CSO Treatment Facility
- ◆ Proposed CSO Facility
- Headworks
- CSO Outfall
- Eliminated CSO Outfall



Figure 4-10
Lower Charles
Back Bay Fens
Recommended Plan

events. New effluent screens would improve the solids and floatables capture, while a new effluent diffuser would eliminate the boil created at times in the Charles River when the facility is discharging flow. Dechlorination would eliminate the potentially toxic chlorine residual in flows discharged. An additional benefit of locating the screening/disinfection/dechlorination facility on the Stony Brook Conduit is that a substantial reduction in stormwater fecal coliform load would also be achieved, without capturing (hence removing) this flow from the Charles River basin. It is anticipated that dry weather flow in the Stony Brook Conduit would be bypassed around the facility.

Water Quality Impacts. CSO is a significant source of fecal coliform in the Lower Charles during individual storm events, but other pollutants such as TSS and BOD are predominantly from stormwater or upstream, non-CSO sources (see Figure 3-2 and Appendix A of this volume). Treating CSO fecal coliforms is therefore appropriate for this waterbody, but providing higher levels of control for other constituents might not achieve a substantial improvement in water quality on an annual basis, as upstream areas constitute by far the most significant source of pollutant loads. As with the Upper Charles, however, additional controls by the MWRA could become appropriate in these areas in the future, pending completion of comprehensive watershed planning and integration with substantial control of stormwater and other non-CSO pollution sources by other parties.

The overall water quality in the Lower Charles has already been substantially impacted by previous projects within the MWRA's CSO program. As mentioned at the beginning of this section, improvements to the transport system have already resulted in substantial reductions in annual CSO volumes since 1988. Increased pumping capacity and reliability at Deer Island has reduced the need to restrict or "choke" wet-weather flows at the Ward Street Headworks, which is a primary cause of overflows into the Lower Charles. Figure 4-11 shows the relationship between the average number of hours per month that flow was restricted at Ward Street, and the annual discharge volume at the Cottage Farm CSO Facility. As the hours of choking decrease, the annual discharge volume also decreases.

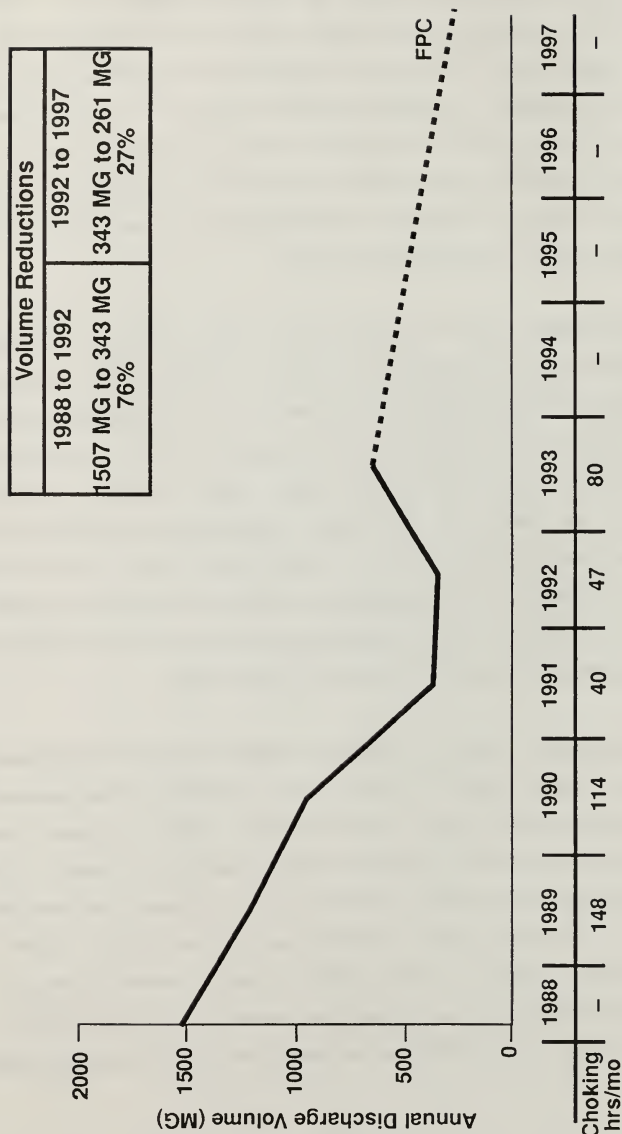


FIGURE 4-11. COTTAGE FARM CSO TREATMENT FACILITY
ANNUAL DISCHARGE VOLUMES

The increases in choking in 1992 and 1993 were caused by construction-related impacts at Deer Island, and the hours are expected to decrease again through 1997.

Siting Issues. It is assumed that the new mechanical equipment at the Cottage Farm CSO Facility could fit within the existing facility. Construction of a new outfall diffuser would involve activities within the Charles River. The existing Charlesgate Gatehouse has been proposed as a location for the screening/disinfection/dechlorination facility on the Stony Brook Conduit. It may also be possible to locate the facility further upstream along the Stony Brook Conduit, in the vicinity of the BWSC gatehouses.

Short term impacts of the work at the Cottage Farm Facility would involve impacts to the Charles River associated with installation of the new diffuser, along with construction-related truck traffic. The types of impacts would depend on the construction techniques applied, however it is unlikely that the work would prevent the passage of river traffic. If the Stony Brook Conduit facilities can be located within the Charlesgate Gatehouse, short term impacts of this work would be limited to construction related traffic. If an alternative site is selected closer to the BWSC Gatehouses, then traffic impacts along the Fenway would be more substantial, along with construction-related noise and dust impacts on the Fens area. Long term site related impacts at the Cottage Farm Facility would be similar to existing conditions, while impacts of the Stony Brook facility would be limited to minor increases in truck traffic associated with facility operation.

Costs. The estimated capital cost for the Cottage Farm Facility work is \$6 million, with incremental annual O&M costs of approximately \$60,000 per year. Capital cost for the Stony Brook facility is estimated at \$25 million, with annual O&M costs of 1,040,000 per year. Total present worth of these projects combined would be \$32.5 million.

Back Bay Fens

The recommended alternative for the Back Bay Fens is to provide manually-cleaned bar racks at outfall BOS046 (Figure 4-10). This alternative would provide control of gross solids and floatables during the relatively infrequent activations of this outfall (≤ 2 per year).

Water Quality Impacts. The predominant source of pollutants to the Back Bay Fens is stormwater (Figure 3-2 and Appendix A of this volume), and the recommended water quality goal for this receiving water segment was to meet Class B water quality standards except for less than four times per year. With manually cleaned bar racks at BOS046, activation of BOS046 on average twice per year would still allow attainment of the recommended goal. This goal, however, is currently not attained due to wet and dry weather non-CSO sources. In other words, the non-CSO sources cause non-attainment of Class B standards more than four times per year.

Siting Issues. The manually-cleaned bar screens could be located within the BWSC Gatehouse No. 1 or on the BOS046 outfall adjacent to Gatehouse No. 1. Restrictions on physical modifications to Gatehouse No. 1 may prohibit use of this facility for this purpose. Short-and long-term site-related impacts of this work would be relatively minor, although measures would be required to minimize the construction impacts on the adjacent Fens.

Costs. Capital costs for this work are estimated at \$0.1 million, with annual O&M costs of approximately \$5,000 per year. Total present worth is approximately \$0.1 million.

ALEWIFE/UPPER MYSTIC

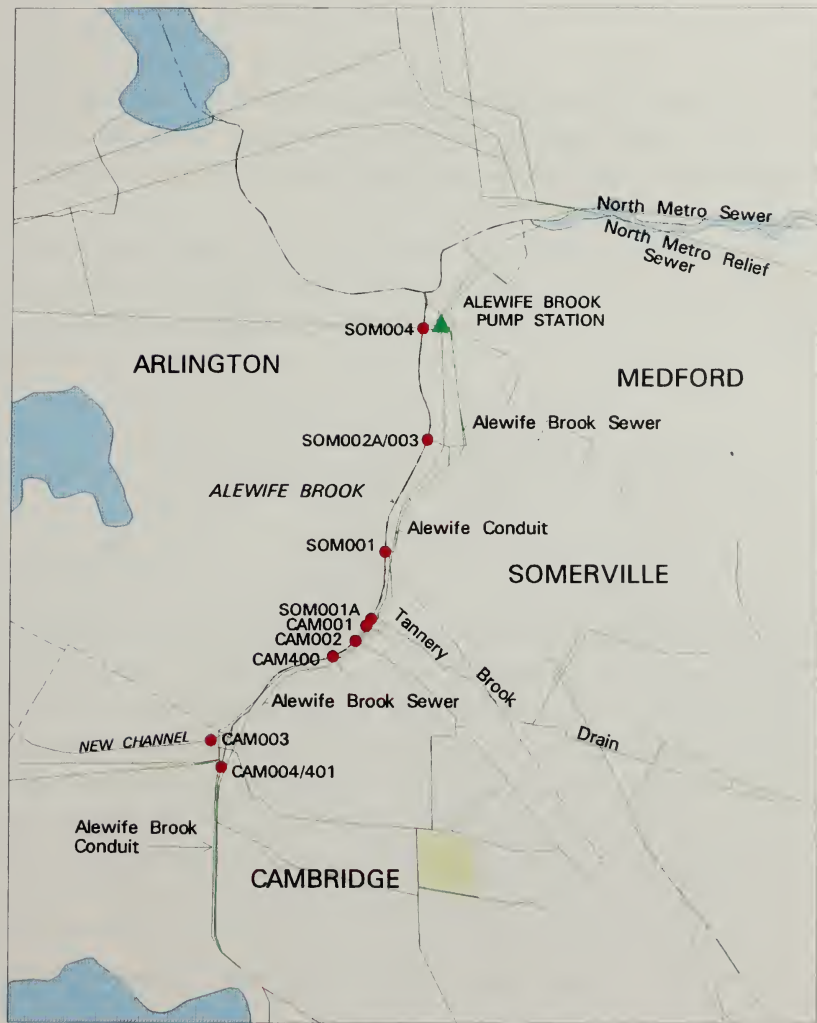
Alewife Brook

Sewer separation upstream of outfall CAM004 is the preferred alternative for Alewife Brook. The general location of the separation work, covering approximately four acres, is presented









in Figure 4-12. Part of this separation work also includes installing new storm drain trunks to reroute separate storm drainage to outfall CAM004, downstream of regulator RE-041. The recommended waterbody goal for Alewife Brook was to meet bacteria standards for swimming except for approximately four times per year, meet DO and aesthetics criteria, and control nutrients (Figure 3-2). This alternative will control overflows from the three-month storm at a substantially lower cost than other identified alternatives (see Table 3-7), since the reduction in stormwater inflow at the upstream end of the Alewife Brook Conduit influences the activation of the downstream regulators. Regulator RE-041 would not be bulkheaded, however, to allow relief of the Alewife Brook Conduit during storms greater than the three-month storm.

This alternative is consistent with planned and on-going sewer separation work in Cambridge and Somerville. Substantial separation work has been completed in Cambridge, while Somerville is considering plans to eliminate the CSOs into the Tannery Brook Drain. Another potential benefit of sewer separation is that flows into Alewife Brook will be increased. Concerns have been raised that alternatives which would capture overflow volumes for treatment at Deer Island could have an adverse effect on Alewife Brook by removing sources of runoff and creating artificially-low brook flow. It is expected that additional optimization or separation upstream of CAM002 will be incorporated into the recommended plan to reduce the currently-predicted overflow frequency of nine per year.

Water Quality Impacts. As indicated in Figure 3-2 and in Appendix A, stormwater is the predominant source of pollutants causing non-attainment of use criteria in Alewife Brook on an annual basis. For the one-year storm, CSO contributes more than half of the fecal coliform bacteria load, approximately one quarter of the BOD load, and one third of the nutrients load. Separation of CAM004 should prevent CSOs from causing non-attainment of the bacteria standard for swimming more than approximately four times per year, in accordance with the waterbody goal indicated in Figure 3-2. Since receiving water modeling was not performed on Alewife Brook, the impacts of non-CSO sources on attainment of use criteria cannot be as clearly defined as in other receiving water segments. However, it



LEGEND

-  Existing Conduit
-  Pump Station
-  CSO Treatment Facility
-  Proposed CSO Facility
-  Headworks
-  CSO Outfall
-  Eliminated CSO Outfall
-  Proposed Sewer Separation

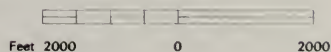


Figure 4-12

Alewife
Recommended Plan



seems likely that stormwater would still contribute to non-attainment of use criteria. As the communities of Cambridge and Somerville proceed with ongoing and planned separation work, it is expected that additional water quality benefits will be attained for Alewife Brook.

Siting Issues. Sewer separation work would involve open cut excavations in streets and existing rights-of-way. Short term impacts of this work would be limited to localized construction-related noise, dust, and disruptions to traffic, while long term site impacts would be negligible.

Costs. The capital cost for this alternative is estimated at \$3 million, with negligible incremental O&M costs. Total present worth as of December, 1995 would be \$3 million.

Upper Mystic River

The recommended alternative for Upper Mystic River, separation of common manholes upstream of SOM007, is a relatively low-cost means for eliminating the CSO at this location, while lower levels of control are substantially less expensive (Figure 4-13). In addition, the recommended plan for outfall MWR205, providing storage of the three-month storm at the Somerville Marginal Facility (described below under "Mystic/Chelsea Confluence"), will reduce the frequency and volume of overflows at SOM007A. Overflows which do occur at SOM007A will receive treatment at the Somerville Marginal Facility. An average of three treated overflows per year at this location was considered to be an appropriate level of control, given that there are no critical uses identified for this receiving water segment, and the CSO sources constitute a small fraction of the total pollutant loads.

Water Quality Impacts. As indicated in Figure 3-2 and in Appendix A, the impact of CSO-related pollutants on the Upper Mystic River is almost undetectable compared with stormwater and upstream sources. With the recommended plan, overflow frequencies will be reduced compared with future planned conditions, as indicated in Table 4-1, and all remaining overflows would be treated. It does not appear that substantial additional

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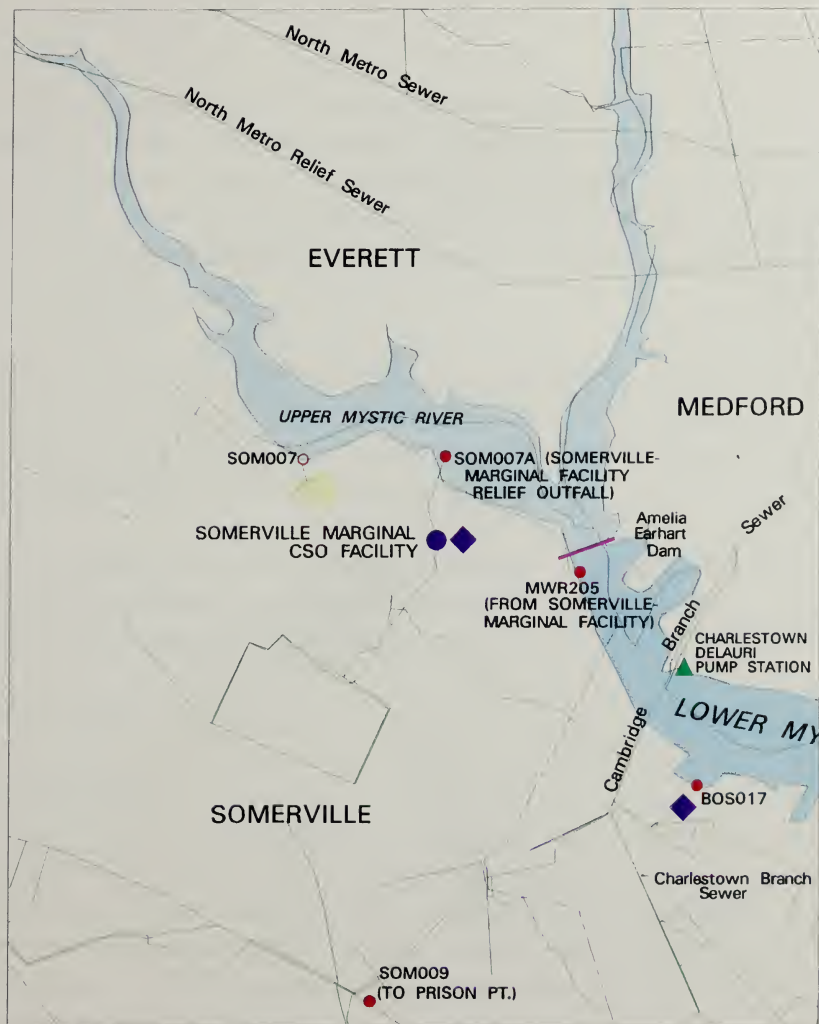
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LEGEND

-  Existing Conduit
-  Pump Station
-  CSO Treatment Facility
-  Proposed CSO Facility
-  Headworks
-  CSO Outfall
-  Eliminated CSO Outfall
-  Proposed Sewer Separation

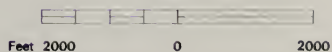


Figure 4-13
Upper Mystic
Recommended Plan

improvement in water quality would be attained by complete elimination of overflows at SOM007A. Although receiving water modeling was not conducted for the Upper Mystic, Figure 3-2 suggests that stormwater and upstream sources would continue to cause non-attainment of use criteria, even with complete elimination of CSOs. Further watershed-based studies would be required to identify and develop a framework for addressing the upstream non-CSO sources of pollutants.

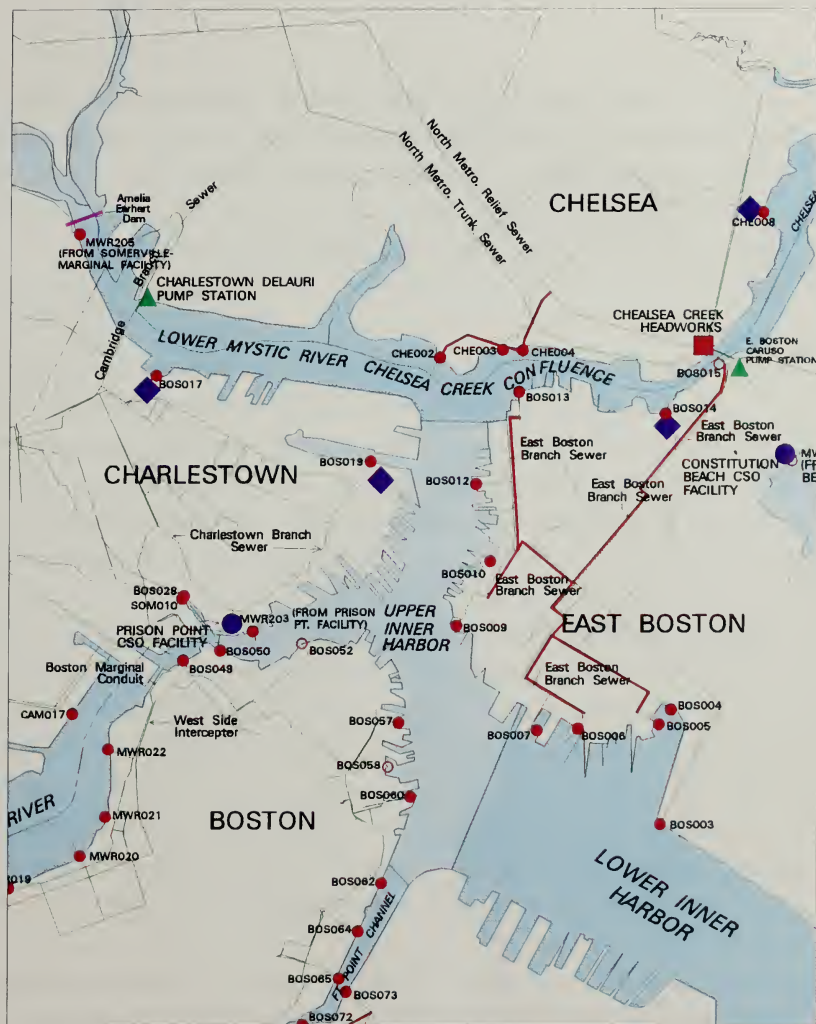
Siting Issues. Separation of common manholes upstream of SOM007 would involve work within existing manholes, which could be completed with minimal impacts to surrounding areas. No additional work would be required at SOM007A, beyond the improvements to the Somerville Marginal CSO Facility, which are described below.

Costs. The capital cost for separation of the common manholes at SOM007 is estimated at \$0.1 million, with negligible incremental annual O&M costs. Present worth of this alternative would be approximately \$0.1 million.

BOSTON HARBOR

Upper Inner Harbor

The preferred alternative for the Upper Inner Harbor includes upgrading the existing Prison Point CSO Facility for dechlorination; providing storage for the three-month storm at BOS019; interceptor relief for BOS009 to BOS013; and coarse screens at BOS050 to BOS060 (Figure 4-14). Providing dechlorination at the Prison Point CSO Facility will eliminate the discharge of potentially toxic chorine residuals into the Upper Inner Harbor. The recommended plan will also involve removing possible upstream flow restrictions and modifying the operating procedures at Prison Point to allow flow into the facility before it starts to backup in the upstream systems. The current operating procedure is to allow ten to 14 feet of head to develop at the facility before the influent gates to the tanks are opened. If the flow were introduced with only 7.6 feet of head at the Facility, overflows at CAM017



and MWR018 to MWR022 would be reduced to the levels indicated on Table 4-1. Further study may identify an optimum balance between reducing upstream overflows, and increasing flows through the Prison Point CSO Facility. SWMM modeling indicates that restrictions may exist in the Cambridge Marginal Conduit and the Charles River Marginal Conduit upstream of the Prison Point facility. Removal of these restrictions would also decrease the upstream hydraulic gradients.

Providing a storage tank sized to capture the three month storm at BOS019 will reduce the annual overflow frequency at that outfall to the 4 to 7 range, and the remaining overflows will be screened and disinfected as the flow passes through the facility. The volume of the tank would be approximately 0.21 MG. The tank could be located below grade, with an above-ground operations building. Potential locations for the facility are in the vicinity of Barry Playground and the Charlestown Navy Yard.

Interceptor relief in East Boston will control overflows to 4-to-7 times per year, and will avoid the need to site a new facility in that densely populated area. This work, in conjunction with interceptor relief for outfalls BOS003 to BOS007, would likely involve replacement of the relatively small-diameter pipe in the upstream reaches of the East Boston Branch Sewer (EBBS), and a parallel relief pipe along the main branch of the EBBS between regulator RE003-12 and the Caruso Pump Station. In downtown Boston, minimum-control level screening along BOS050 to 060 was considered appropriate due to the relative inactivity of those outfalls (less than four activations per year under future planned conditions).

Water Quality Impacts. As indicated in Figures 4-1 and 4-2, non-CSO sources to the Upper Inner Harbor would prevent attainment of the shellfishing and swimming standards during the one-year storm even with complete elimination of CSOs. The recommended alternative for this receiving water segment will substantially reduce the frequency of untreated overflows as shown in Table 4-1. As indicated in Figure 3-2, the recommended water quality goals for Upper Inner Harbor were to meet bacteria standards for swimming except for approximately four times per year, to meet criteria for dissolved oxygen (D.O.)

and aesthetics, and to reduce toxics. Under the recommended plan, those goals would generally be achievable assuming non-CSO sources of pollutants were also controlled. The non-CSO sources include stormwater, and tributary flow from the Chelsea and Mystic Rivers.

Siting Issues. It is anticipated that the dechlorination equipment for the Prison Point CSO Facility would fit within the existing facility, and that short- and long-term site impacts of this work would not be different from existing conditions. Potential impacts of the storage facility at BOS019 depend on the final location of the facility. Once the facility is constructed, it is expected that the area over the tank could be reused for recreation, parking, or other purposes. An above-ground operations building would be required. Interceptor relief in East Boston would involve local construction-related dust, noise, and traffic impacts, with negligible long-term site impacts.

Costs. The capital cost of the work at Prison Point is estimated at \$2 million, with a total annual O&M cost for the facility of \$740,000 per year. The capital cost of the BOS019 facility is approximately \$4 million, with a \$120,000 per year O&M cost. The East Boston Interceptor relief work would be approximately \$16 million, with negligible incremental O&M costs. Total present worth of these projects would be \$26.5 million.

Lower Inner Harbor

Interceptor relief for outfalls BOS003 to 007 in East Boston is the preferred alternative for the Lower Inner Harbor (Figure 4-14). This alternative is consistent with interceptor relief for outfalls BOS009 to BOS013 in the Upper Inner Harbor and will provide full relief of the EBBS. In turn, relief of the EBBS will more fully utilize transport and treatment capacity available through the Caruso Pump Station, North Metropolitan Trunk Sewer, and Winthrop Terminal Headworks.

Part of this alternative involves modifying the operating procedures at the Caruso Pump Station. Currently, when flow exceeds the capacity of the dryside pumps, flows must back up to an elevation of 96.0 before passing over a weir into the wetside wetwell. Flow from the EBBS and the East Boston Low Level Sewer enters the dry-side wetwell at the Caruso Pump Station at an invert elevation of 84.0. A gate is provided on this influent conduit to allow flow to be diverted to the wet-side wetwell. If the gate to the wet side wetwell could be opened when the water surface in the dry side wetwell reached elevation 84.0, an approximately 12-foot reduction in the hydraulic gradient at the pump station could be achieved during periods of high flows. This reduction in downstream hydraulic gradient would improve the performance of interceptor relief during the one-year storm.

Water Quality Impacts. As with the Upper Inner Harbor, even complete elimination of CSOs will not result in achievement of the restricted shellfishing and swimming standards in the Lower Inner Harbor during the one-year storm. However, as indicated in Table 4-1, interceptor relief will reduce annual overflow frequencies at outfalls BOS003 to BOS007 from a range of 4-29 to a range of 0-5. The recommended water quality goal for Lower Inner Harbor indicated in Figure 3-2 is the same as the Upper Inner Harbor, and the recommended alternative would allow for achievement of this goal provided that non-CSO sources of pollutants were also controlled.

Siting Issues. Interceptor relief work in East Boston would involve open cut excavation in streets and existing rights-of-way. Short term impacts of this work would include localized construction-related noise, dust, and disruptions to traffic, while long term site impacts would be negligible.

Costs. Capital costs for this work are estimated at \$20 million, with negligible incremental annual O&M costs. Total present worth as of December, 1995 would be \$15.7 million.

Mystic/Chelsea Confluence

Preferred alternatives for this receiving water segment includes upgrading the Somerville Marginal CSO Facility to provide storage of the three-month storm; providing screening, disinfection and dechlorination facilities at outfalls BOS014, BOS017, and CHE008; and providing interceptor relief for Chelsea outfalls CHE002 to CHE004 (Figure 4-14). As described in Section Three, the Mystic/Chelsea confluence is bordered primarily by industrial areas, with the waterway supporting predominately industrial maritime uses. The screening, disinfection and dechlorination facilities proposed for outfalls BOS014, BOS017, and CHE008 are consistent with the existing land uses.

A dissolved oxygen deficit observed in the vicinity of outfall MWR205 favors the selection of storage over continued screening and disinfection at the Somerville Marginal Facility. The storage facility will include an approximately 4.8 MG tank, along with screening, disinfection, and dechlorination equipment. Flows in excess of the tank volume will pass through the tank, receiving treatment, before being discharged at either MWR205 or SOM007A, depending on tidal stage. The existing Somerville Marginal CSO Facility is to be relocated as part of the modifications to Route I-93. Siting of the new facility would have to be coordinated with the Massachusetts Highway Department.

At CHE002 to CHE004, a relief interceptor will replace the existing undersized interceptor carrying flows from this area to the North Metropolitan Trunk Sewer. It is expected that the currently-predicated nine overflows per year at CHE003 will be reduced through optimization of the relief project.

Water Quality Impacts. As with the Inner Harbor, elimination of CSOs to the Mystic Chelsea Confluence will not result in attainment of restricted shellfishing and swimming standards (Figures 4-1, 4-2). However, the recommended plan will substantially reduce the overflow frequency as indicated in Table 4-1 and the potential human pathogen load to this waterbody. The recommended water quality goal for this industrial waterway was to meet

bacteria standards for swimming except for approximately four overflows per year, and meet D.O. and aesthetics standards. Presuming additional optimization at CHE003, the recommended plan would allow achievement of this goal assuming non-CSO sources were also controlled. Non-CSO sources include stormwater runoff and tributary flow from the Mystic and Chelsea Rivers.

Siting Issues. Short-term impacts of the upgrade of the Somerville Marginal Facility will depend on the final location of the facility, which in turn must be coordinated with the planned I-93 ramp modifications. Depending on the timing of the work, the construction-related impacts may be incidental to the I-93 work. Long-term site impacts would not be substantially different from existing conditions, other than that the actual location of the facility may be different.

The screening/disinfection/dechlorination facilities at BOS014, BOS017, and CHE008 would be located on the overflow conduits for the respective outfalls. The CHE008 facility would be located within the Gulf Oil terminal, where there would be a potential for encountering contaminated soil. Short-term disruptions to sensitive receptors would be minimal, while long term site impacts would be limited to a slight increase in truck traffic.

Interceptor relief work at CHE002 to CHE004 would involve open cut excavation in existing streets and rights-of-way. Short-term impacts would include localized construction-related noise, dust, and traffic disruptions. The most severe traffic impacts would be at the busy intersection of Pearl and Marginal Streets. Long-term site impacts of this work would be negligible.

Costs. The capital cost for the storage facility at Somerville Marginal is estimated at \$24 million, with \$460,000 per year in annual O&M costs. Capital costs for the screening/disinfection/dechlorination facilities would total \$6 million, with approximately \$240,000 per year in O&M costs. Interceptor relief in Chelsea would have a capital cost of

\$2 million, with negligible incremental O&M costs. Total present worth for these projects would be approximately \$23 million.

Reserved Channel

The recommended alternative for this receiving water segment is to consolidate outfalls BOS076 to BOS080 to a screening, disinfection, and dechlorination facility in the vicinity of BOS080 (Figure 4-6). The screening and disinfection facility would also treat flow from the consolidation conduit serving to relocate overflows from North Dorchester Bay, as described above. The consolidation conduit for outfalls BOS076 to BOS080 would run parallel to East First Street, and would likely be installed using near-surface tunneling techniques. The volume of the conduit would hold more than 70 percent of the overflow volume to the Reserved Channel from BOS076 to BOS080 for the three-month storm.

Water Quality Impacts. As indicated in Figure 3-2, CSOs are the predominant source of fecal coliform bacteria to the Reserved Channel. The consolidation conduit in conjunction with the screening/disinfection facility at the mouth of the Reserved Channel will substantially reduce the fecal coliform load to this waterbody, to the extent that the swimming standard will be met for the one-year storm (Figure 4-2). A benefit of the consolidation conduit is that by sizing the conduit for the two-year storm, overflows to the upstream reaches of the Reserved Channel are virtually eliminated. Flows are essentially relocated to the mouth of the Reserved Channel, where there is an opportunity for much greater dilution of discharged flows. The recommended water quality goal for Reserved Channel was to meet bacteria standards for swimming except for approximately four times per year, and meet aesthetic criteria. Since the impacts of non-CSO sources on the Reserved channel are relatively minor, the recommended alternative actually would exceed the recommended goal, as indicated in Figure 4-2.

Siting Issues. Assuming that tunneling techniques would be used for the consolidation conduit, construction-related surface impacts would be limited to access shafts, while long-

term site impacts of the conduit would be negligible. Impacts of the screening facility, located in the vicinity of the Conley Marine Terminal, were described above.

Costs. The capital costs for the consolidation conduit and incremental cost for the screening/disinfection/dechlorination facility were estimated at \$41 million, with annual O&M costs of \$610,000. Total present worth for this alternative would be \$39 million.

Fort Point Channel

The preferred alternative for this receiving water segment includes manually-cleaned bar screens at outfalls BOS062 to BOS068, a detention/disinfection/dechlorination facility at Union Park Pump Station, in-line storage in the Dorchester Brook Conduit (DBC), and a consolidation/storage conduit between BOS072 and BOS073 (Figure 4-6). The construction of the consolidation/storage conduit for outfalls BOS072 and BOS073 will require close coordination with the Central Artery/Tunnel project. Manual bar racks were considered appropriate for BOS062 to BOS068, due to the relative inactivity of these outfalls as indicated in Table 4-1. The Union Park facility will provide storage for small storms, and less than primary treatment with disinfection and dechlorination for the three-month storm. The detention tank, with a volume of approximately 2.2 MG, will be located in a parking lot next to the Union Park Pumping Station.

Through the installation of a hydraulic gate, a pump-out station, and piping modifications, the existing DBC can be used to store overflows from up to the one-year storm from regulators 070/8-11 to 070/10-5 along the South Boston Interceptor North Branch. The hydraulic gate would be located on the DBC just upstream of where the DBC joins the Roxbury Canal Conduit (RCC). The connections between the two-barrel DBC and the west barrel of the BOS070 outfall will be bulkheaded, and the two barrels of the DBC will be rejoined at the hydraulic gate. The gate will remain normally closed, to prevent overflows to BOS070, and to prevent the tide from backing up into the DBC. On extremely high flows, the gate will open, to prevent upstream flooding. A pumpout station will be provided

upstream of the gate, to return the stored contents to either the East Side Interceptor or the South Boston Interceptor North Branch. Flows from RE070/10-5 will either be repiped to upstream of the gate, or RE070/10-5 could be further optimized to direct more flows to outfall BOS072. During the workshops, concern was raised over the possible presence of groundwater pressure relief openings within the walls of the DBC. The existence and condition of these holes, as well as the impact on surrounding groundwater levels, should be further evaluated.

The consolidation/storage conduit with pump-out station running between BOS072 and 073 would store the overflows from the three-month storm.

Water Quality Impacts. As indicated in Figure 3-2, CSOs are a predominant source of pollutants to the Fort Point Channel, particularly with regard to fecal coliform bacteria. However, as indicated in Figures 4-1 and 4-2, complete elimination of CSOs would not result in attainment of restricted shellfishing and swimming standards during the one-year storm as measured at the mouth of the channel. The proposed facilities would, however, substantially reduce the potential human pathogen load to the channel and improve aesthetics, which would be consistent with existing uses. These facilities would also provide a higher level of control of BOD and TSS to Fort Point Channel than flow-through screening/disinfection/dechlorination facilities, reducing BOD and TSS by about 20 percent.

The recommended water quality goal for Fort Point channel was the same as for the Reserved Channel, and it appears that the bacteria standard for swimming would not be exceeded more than approximately four times per year with the recommended plan. With aesthetics also being controlled, the recommended water quality goal would be met with the recommended alternative.

Siting Issues. Construction of the detention facility at Union Park Pumping Station would impact residential areas including elderly housing units in the vicinity of the pump station. Long term impacts would not be substantially different than existing conditions. It is

expected that the tanks would be located below grade, and that the area above the tanks would be available for other uses.

A potential for encountering contaminated soil has been identified along the route of the consolidation/storage conduit between BOS072 and BOS073. Short term impacts of this work would involve temporary disruption of parking facilities, while long term impacts would be relatively minor. The work to develop storage in the DBC would involve activities on the Gillette property, which may create short-term disruptions to traffic and parking. Long-term site impacts would be limited to a relatively innocuous control structure above grade.

Costs. The capital cost of the detention facility at Union Park is estimated at \$16 million, with annual O&M costs of \$990,000. Capital costs for the consolidation/storage facility at BOS072 and BOS073, and the in-line storage in the DBC are \$5 and \$4 million, respectively, with annual O&M costs of 120,000 and \$20,000 per year, respectively. Capital costs for the manually cleaned bar screens at outfalls BOS062 to BOS068 are approximately \$1.0 million, with \$20,000 per year in annual O&M costs. Total present worth for this alternative is \$35 million.

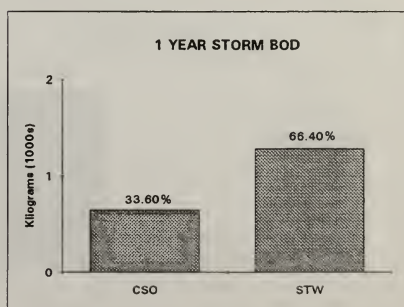
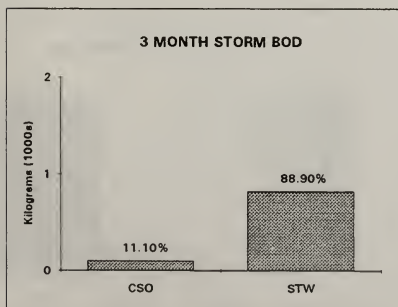
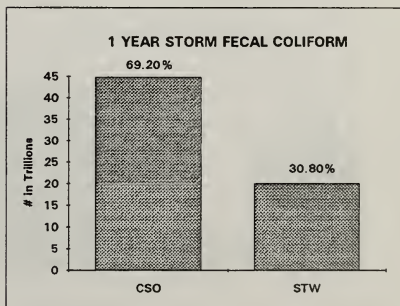
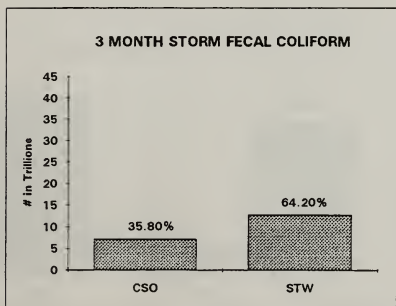
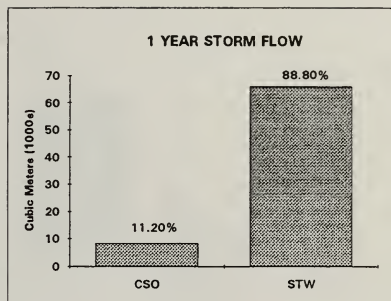
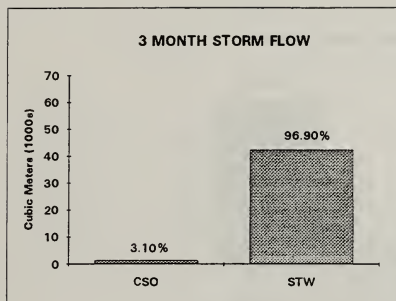
FIGURE 2-6. SYSTEM WIDE CSO STRATEGIES

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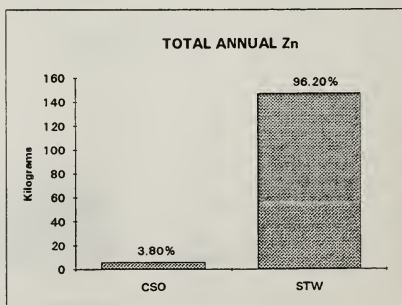
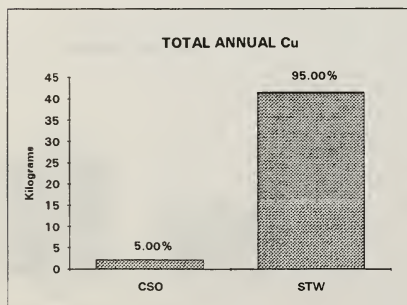
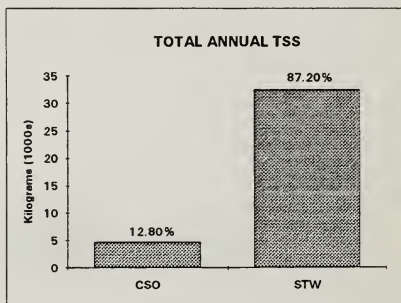
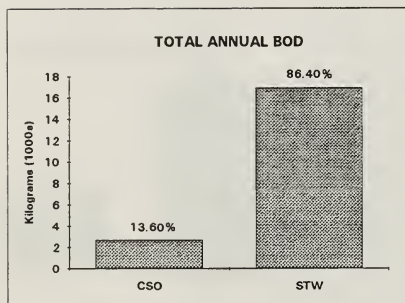
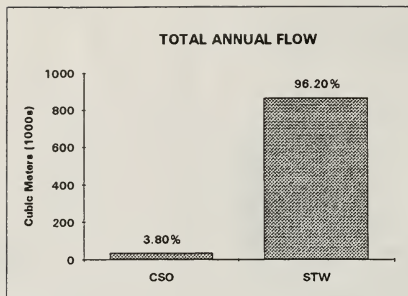
VOLUME TWO

APPENDIX A

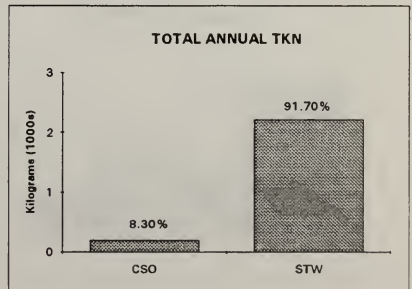
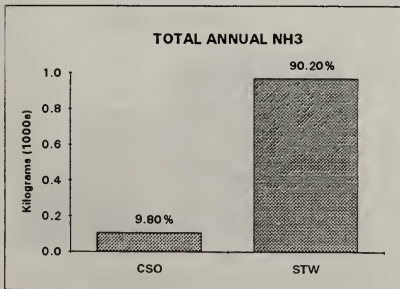
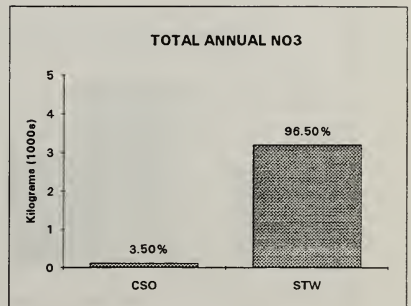
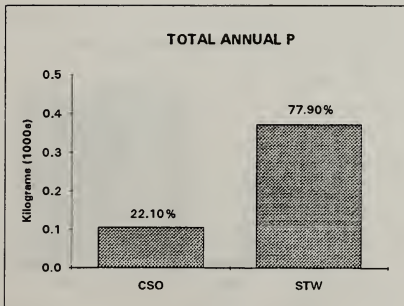
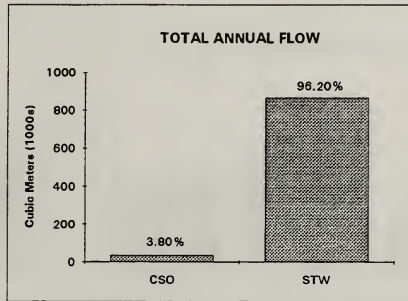
**FUTURE PLANNED FLOWS AND LOADS
TO RECEIVING WATER SEGMENTS
FROM CSO, STORMWATER AND UPSTREAM SOURCES**



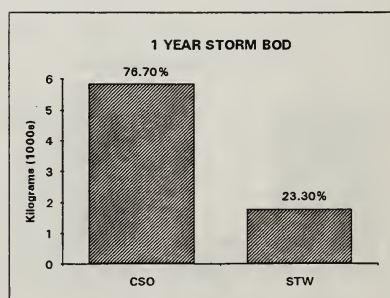
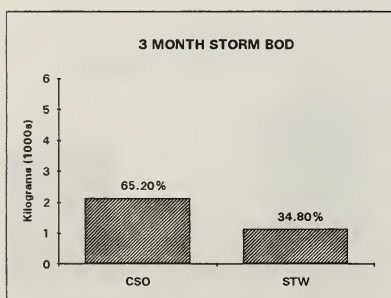
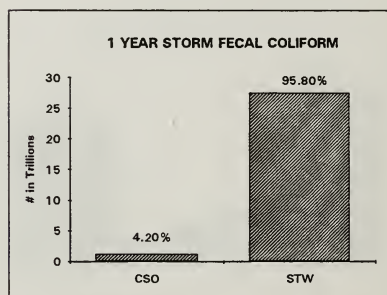
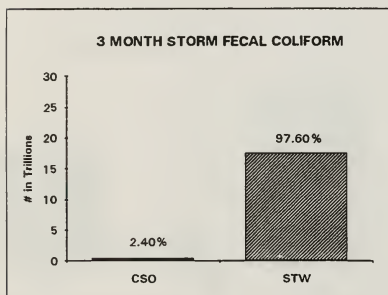
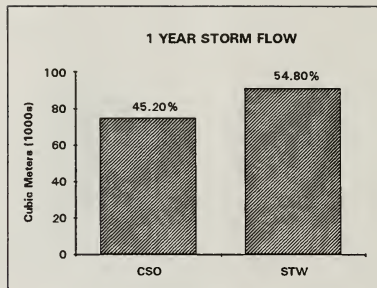
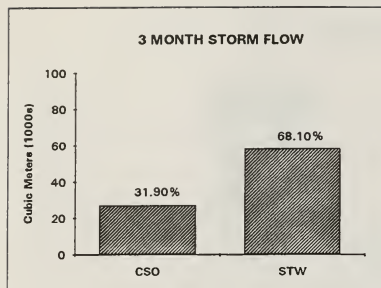
**FUTURE PLANNED FLOWS AND LOADS FOR THREE MONTH
AND ONE YEAR STORM EVENTS - NORTH DORCHESTER BAY**



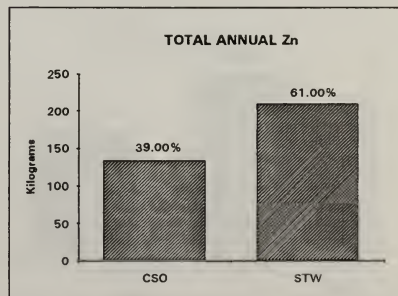
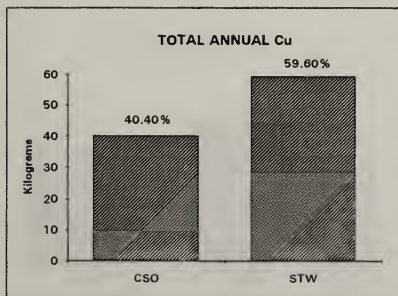
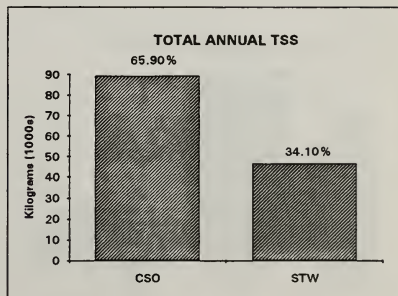
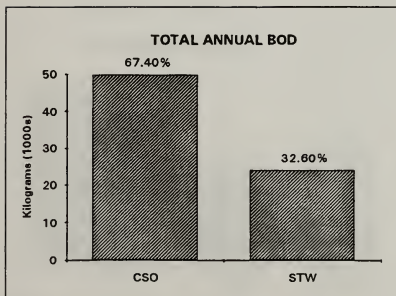
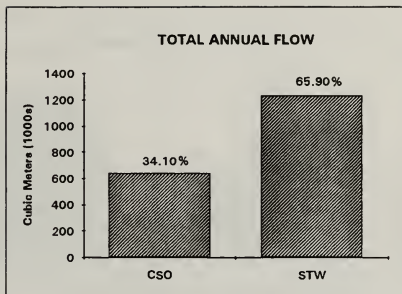
**FUTURE PLANNED ANNUAL FLOWS AND LOADS - NORTH DORCHESTER BAY
FLOW, BIOCHEMICAL OXYGEN DEMAND, TOTAL SUSPENDED SOLIDS, COPPER, ZINC**



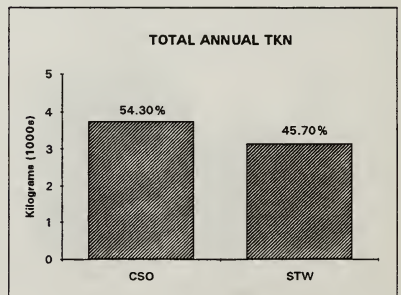
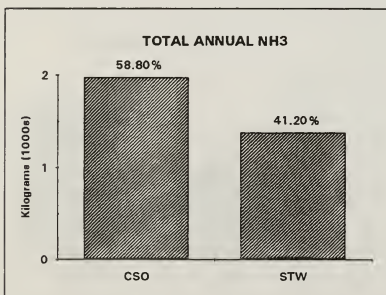
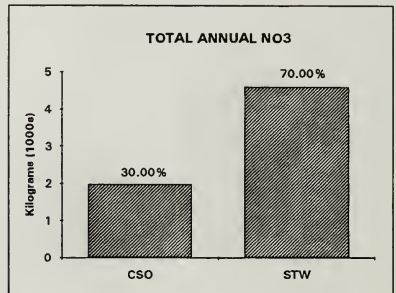
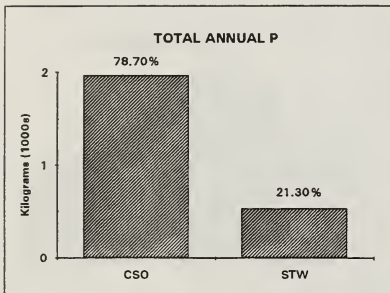
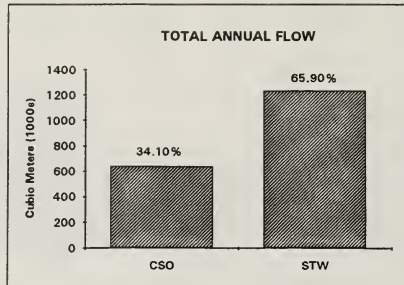
**FUTURE PLANNED ANNUAL FLOWS AND LOADS - NORTH DORCHESTER BAY
FLOW, TOTAL PHOSPHORUS, NITRATE, AMMONIA, TOTAL KJELDAHL NITROGEN**



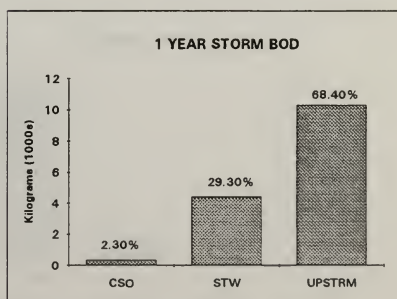
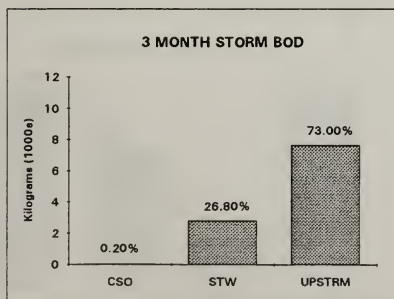
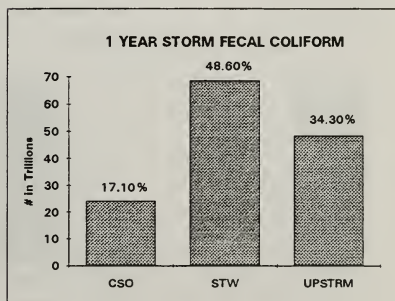
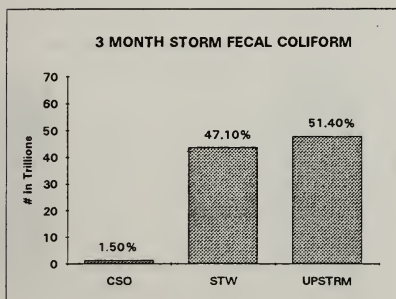
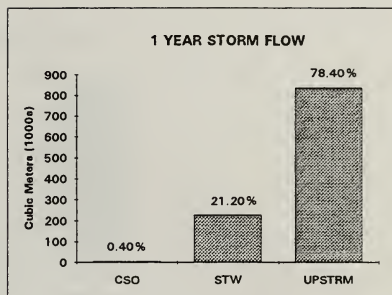
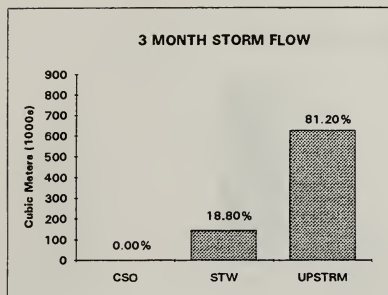
**FUTURE PLANNED FLOWS AND LOADS FOR THREE MONTH
AND ONE YEAR STORM EVENT - SOUTHERN DORCHESTER BAY**



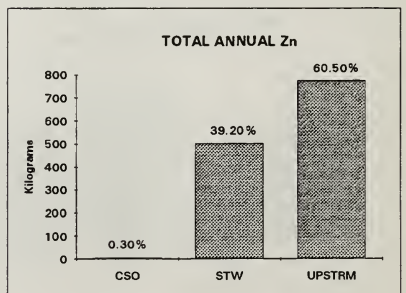
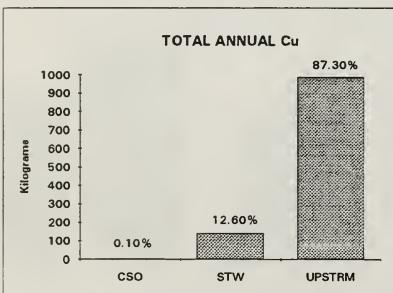
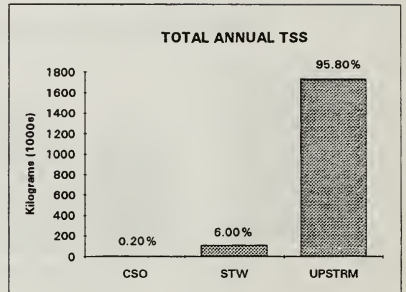
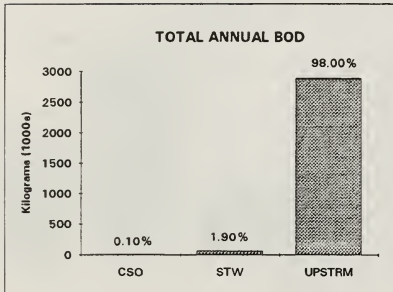
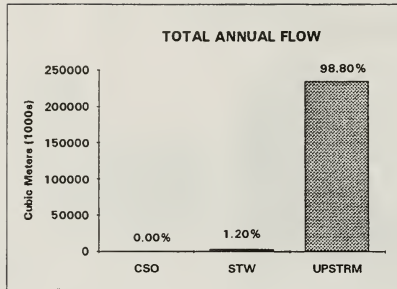
**FUTURE PLANNED ANNUAL FLOWS AND LOADS FOR SOUTHERN DORCHESTER BAY
FLOWS, BIOCHEMICAL OXYGEN DEMAND, TOTAL SUSPENDED SOLIDS, COPPER, ZINC**



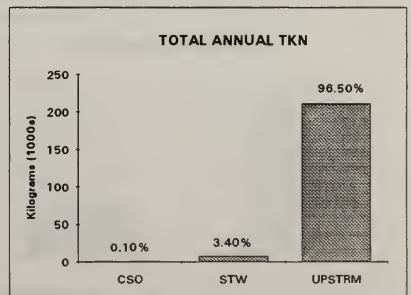
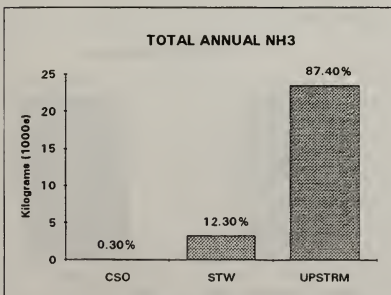
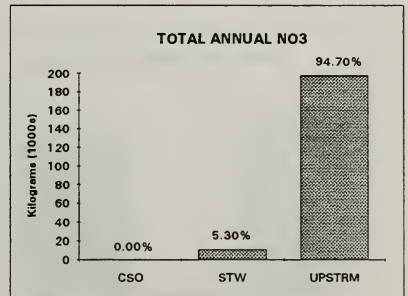
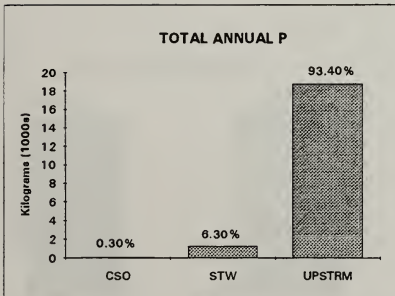
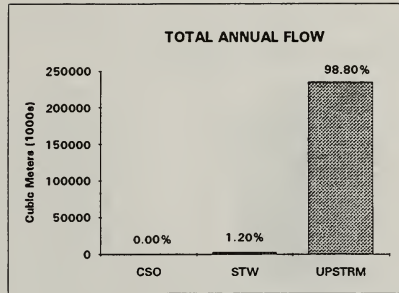
**FUTURE PLANNED ANNUAL FLOWS AND LOADS FOR SOUTHERN DORCHESTER BAY
FLOWS, TOTAL PHOSPHORUS, NITRATE, AMMONIA, TOTAL KJELDAHL NITROGEN**



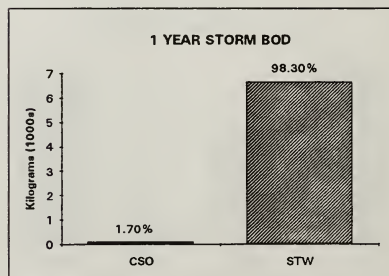
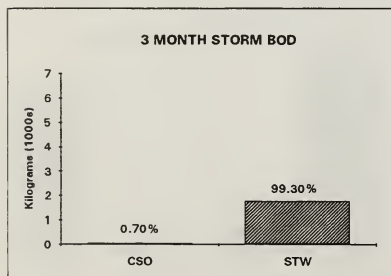
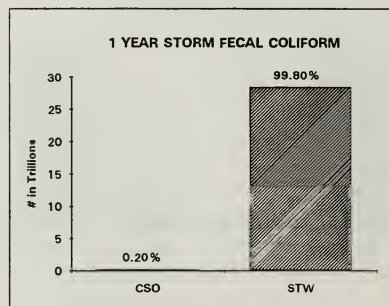
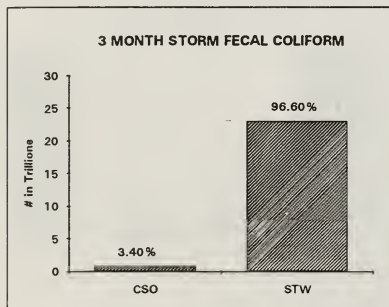
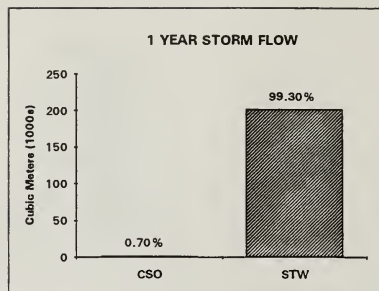
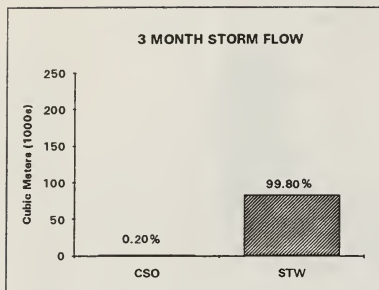
**FUTURE PLANNED FLOWS AND LOADS FOR THREE MONTH
AND ONE YEAR STORM EVENTS - NEPONSET RIVER**



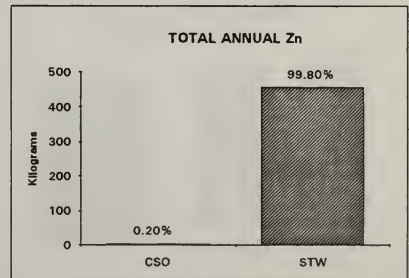
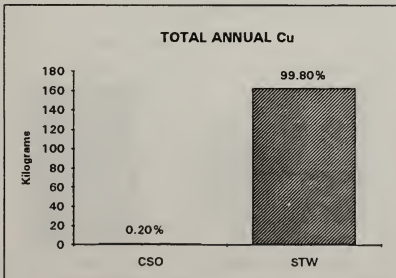
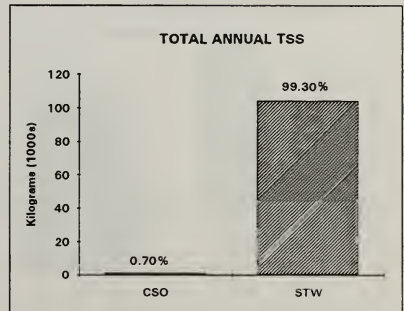
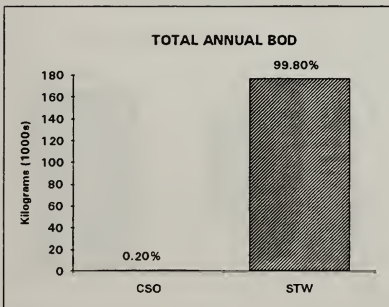
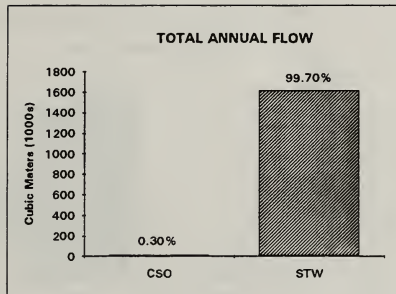
**FUTURE PLANNED ANNUAL FLOWS AND LOADS - NEPONSET RIVER
FLOWS, BIOCHEMICAL OXYGEN DEMAND, TOTAL SUSPENDED SOLIDS, COPPER, ZINC**



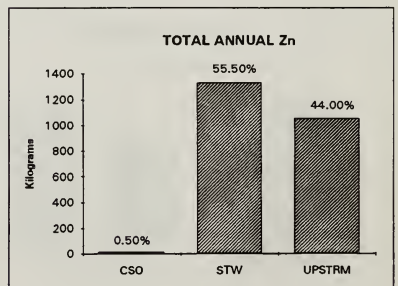
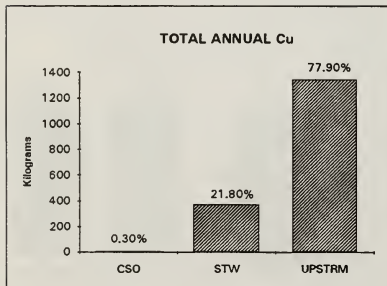
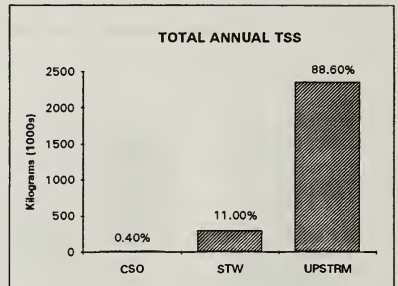
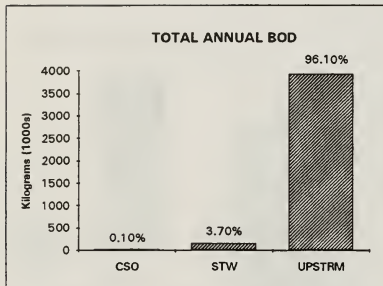
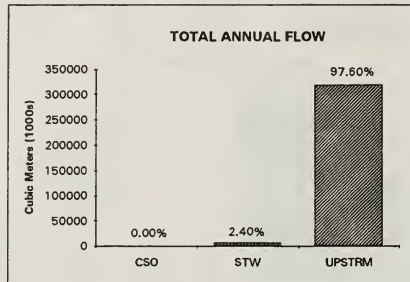
**FUTURE PLANNED ANNUAL FLOWS AND LOADS - NEPONSET RIVER
FLOWS, TOTAL PHOSPHORUS, NITRATE, AMMONIA, TOTAL KJELDAHL NITROGEN**



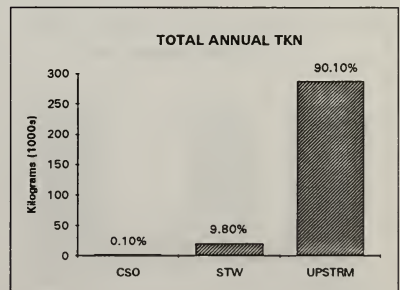
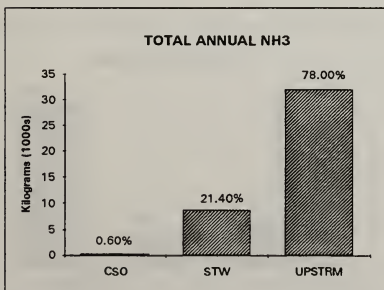
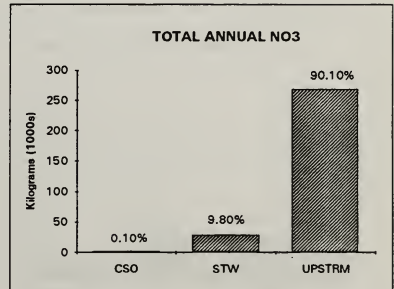
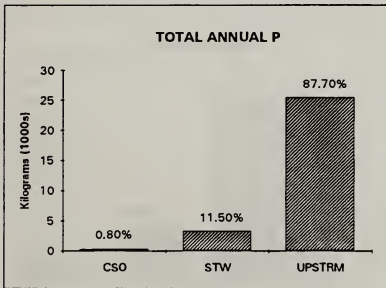
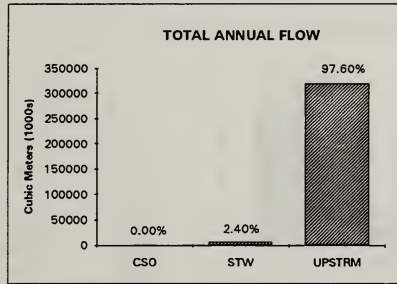
**FUTURE PLANNED FLOWS AND LOADS FOR THREE MONTH
AND ONE YEAR STORM EVENTS - CONSTITUTION BEACH**



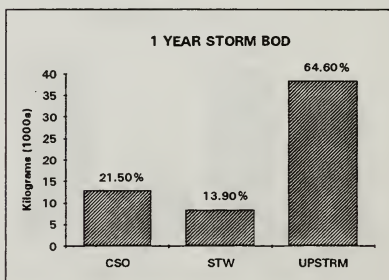
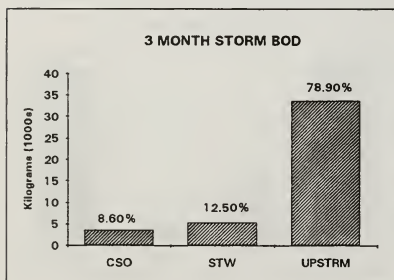
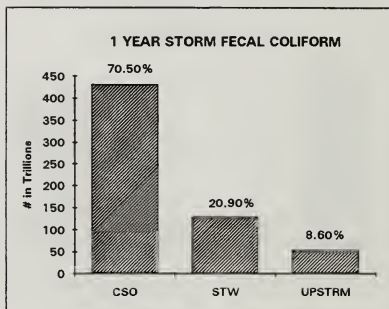
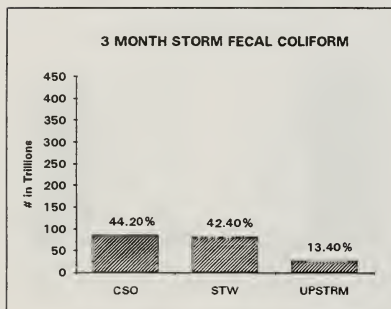
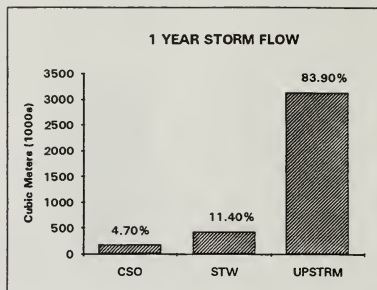
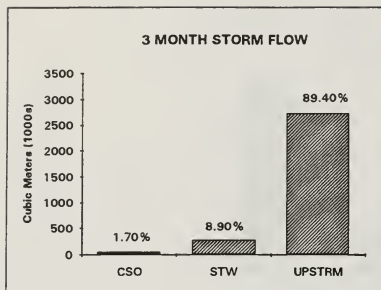
**FUTURE PLANNED ANNUAL FLOWS AND LOADS -CONSTITUTION BEACH
FLOW, BIOCHEMICAL OXYGEN DEMAND, TOTAL SUSPENDED SOLIDS, COPPER, ZINC**



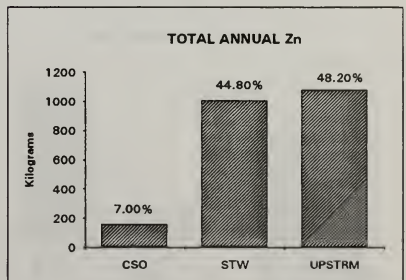
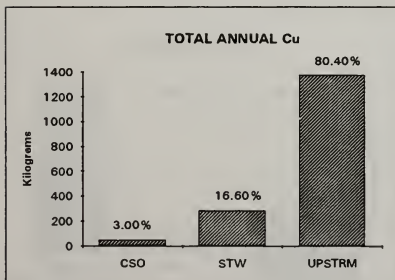
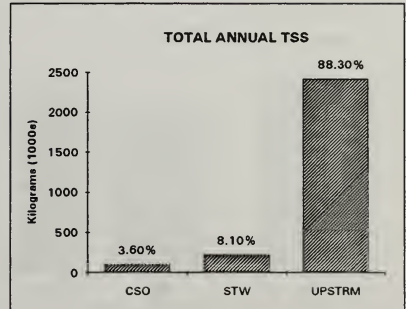
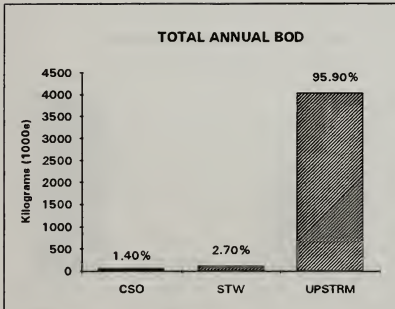
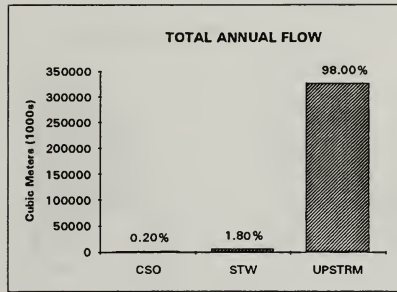
FUTURE PLANNED FLOWS AND LOADS - UPPER CHARLES RIVER
FLOWS, BIOCHEMICAL OXYGEN DEMAND, TOTAL SUSPENDED SOLIDS, COPPER, ZINC



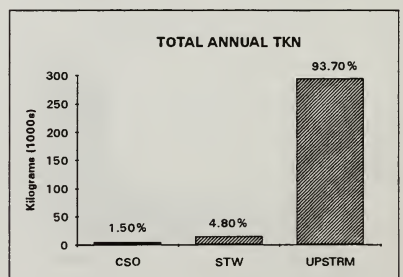
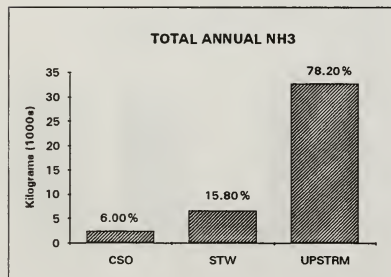
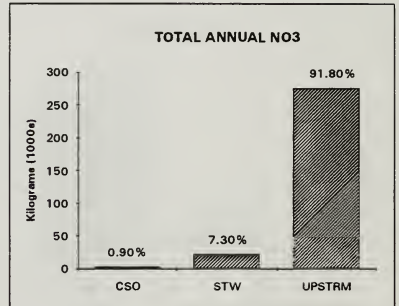
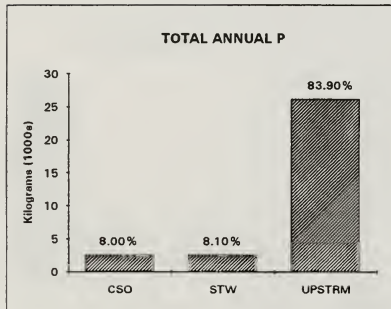
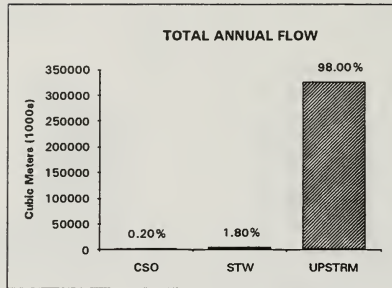
**FUTURE PLANNED FLOWS AND LOADS - UPPER CHARLES RIVER
FLOWS, TOTAL PHOSPHORUS, NITRATE, AMMONIA, TOTAL KJELDAHL NITROGEN**



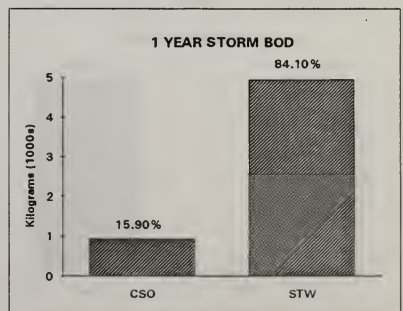
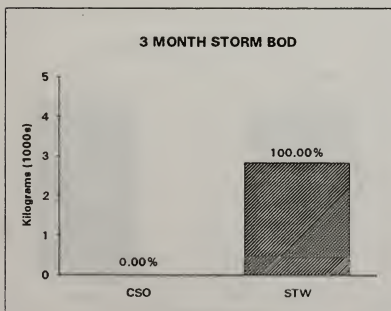
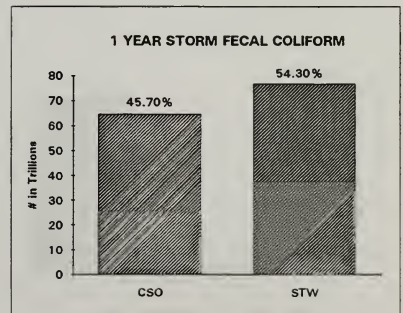
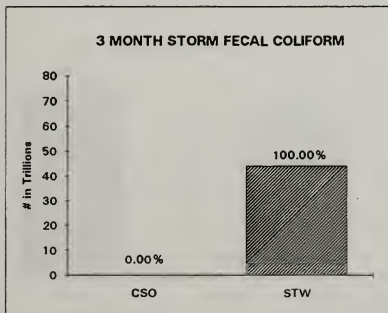
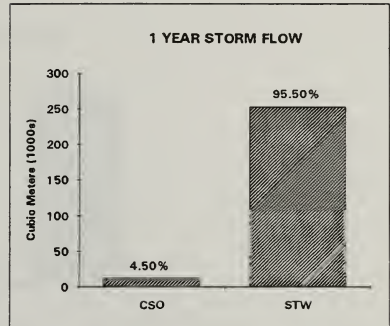
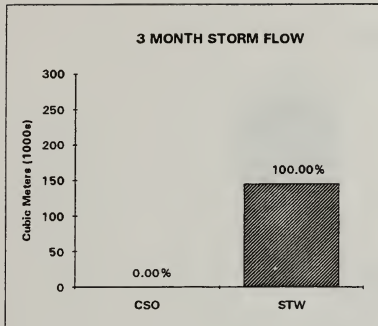
**FUTURE PLANNED FLOWS AND LOADS FOR THREE MONTH
AND ONE YEAR STORM EVENTS - LOWER CHARLES RIVER**



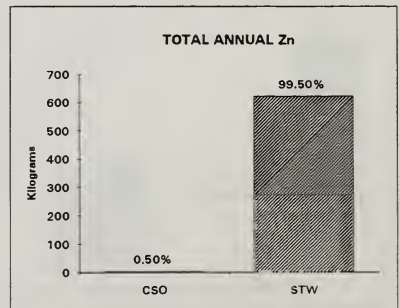
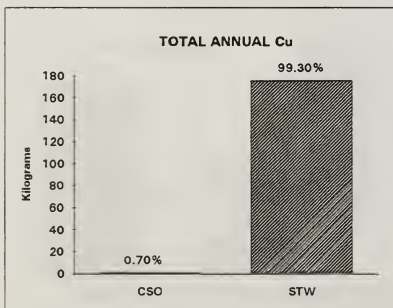
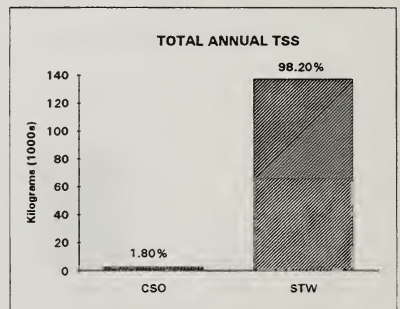
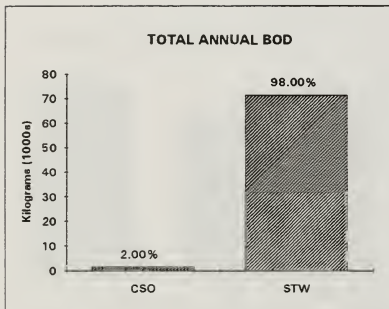
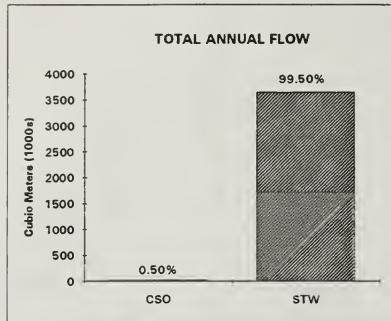
**FUTURE PLANNED ANNUAL FLOWS AND LOADS -LOWER CHARLES RIVER
FLOW, BIOCHEMICAL OXYGEN DEMAND, TOTAL SUSPENDED SOLIDS, COPPER, ZINC**



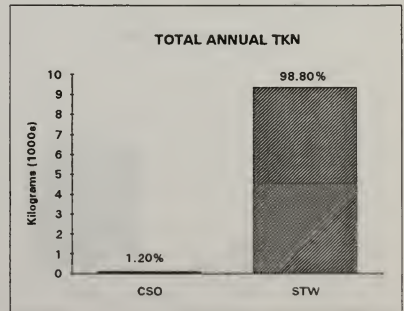
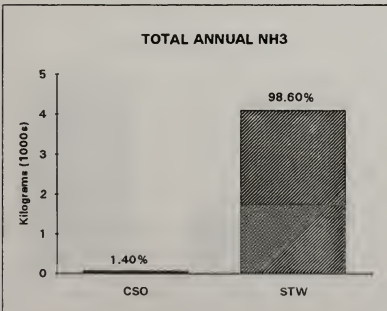
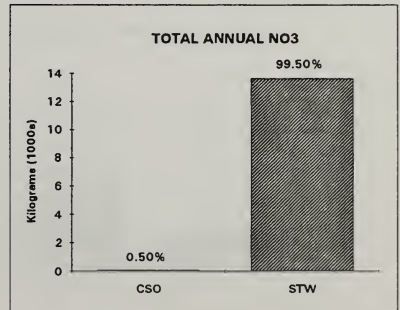
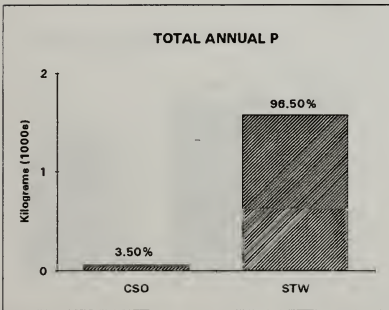
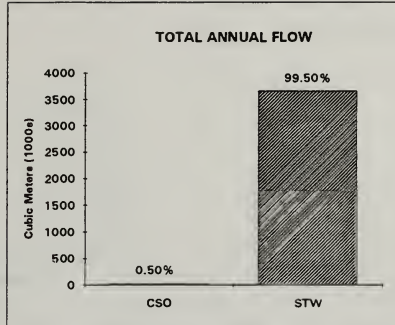
**FUTURE PLANNED ANNUAL FLOWS AND LOADS -LOWER CHARLES RIVER
FLOW, TOTAL PHOSPHORUS, NITRATE, AMMONIA, TOTAL KJELDAHL NITROGEN**



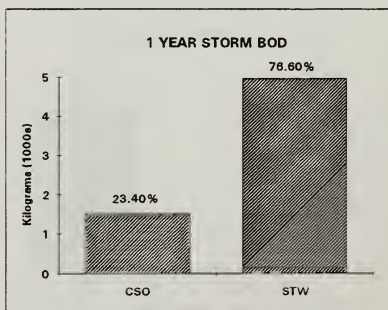
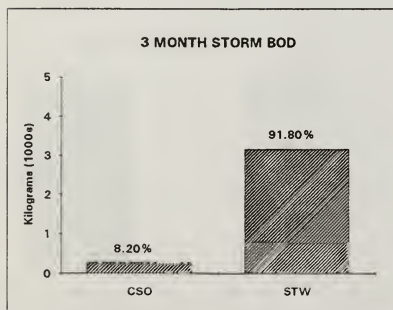
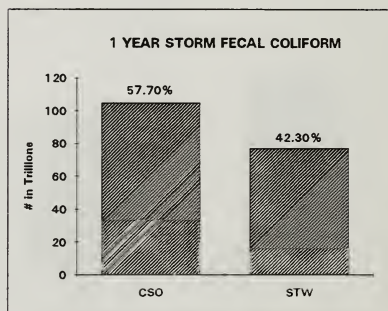
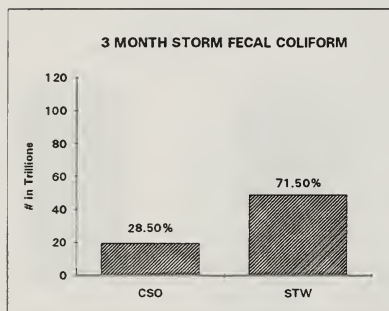
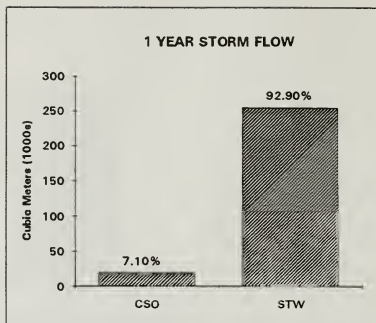
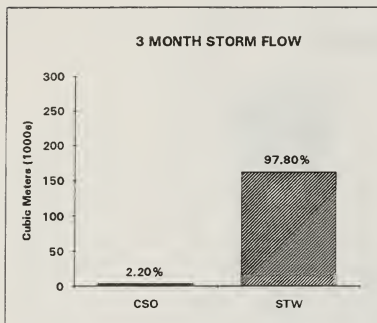
**FUTURE PLANNED FLOWS AND LOADS FOR THE THREE MONTH
AND ONE YEAR STORM EVENTS - BACK BAY FENS/MUDDY RIVER/STONY BROOK**



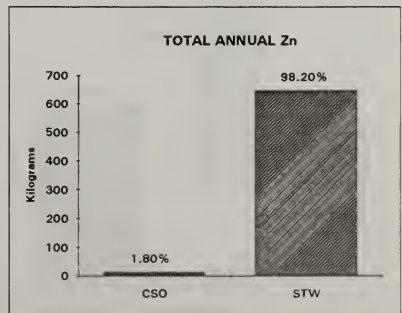
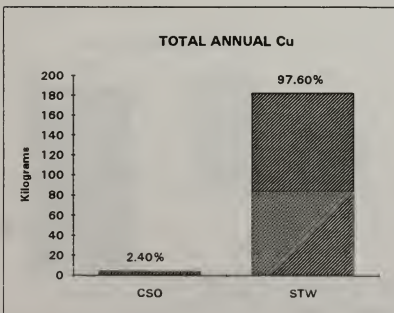
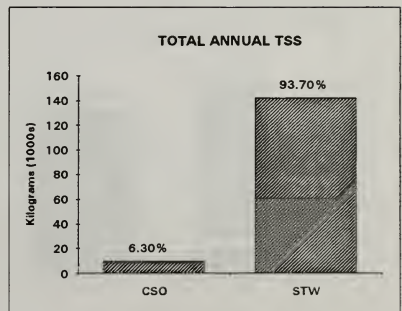
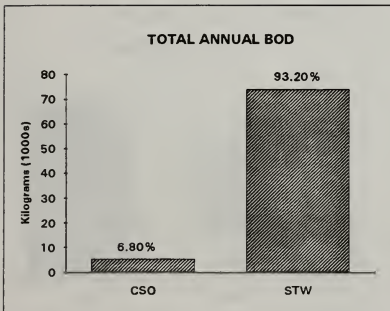
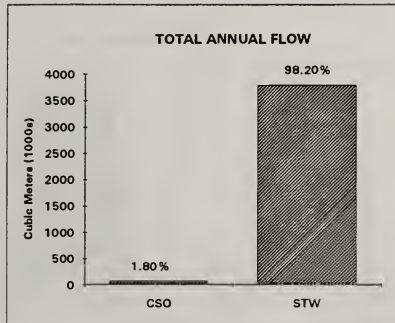
**FUTURE PLANNED ANNUAL FLOWS AND LOADS - BACK BAY FENS
FLOW, BIOCHEMICAL OXYGEN DEMAND, TOTAL SUSPENDED SOLIDS, COPPER, ZINC**



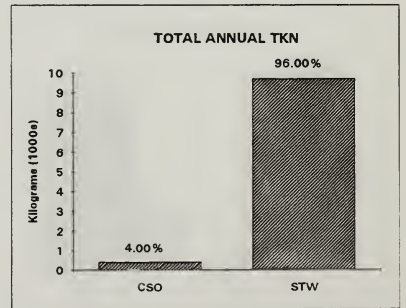
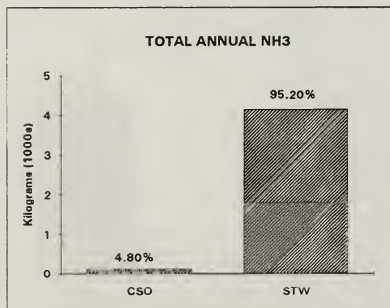
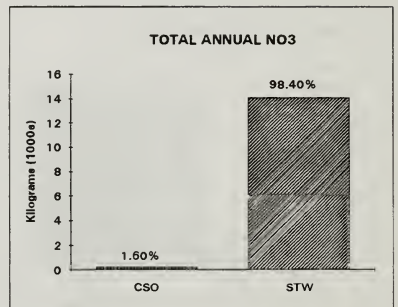
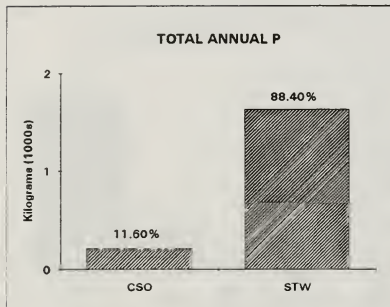
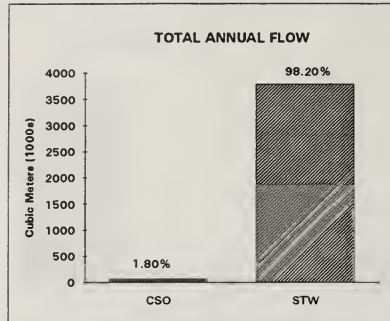
FUTURE PLANNED ANNUAL FLOWS AND LOADS - BACK BAY FENS
FLOW, TOTAL PHOSPHORUS, NITRATE, AMMONIA, TOTAL KJELDAHL NITROGEN



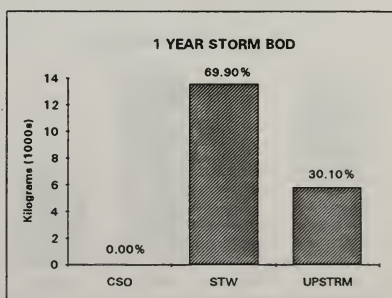
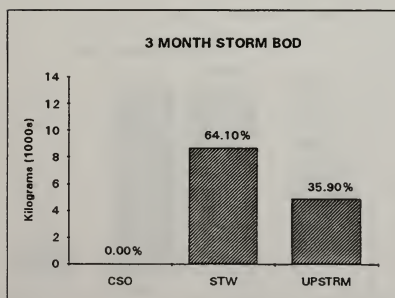
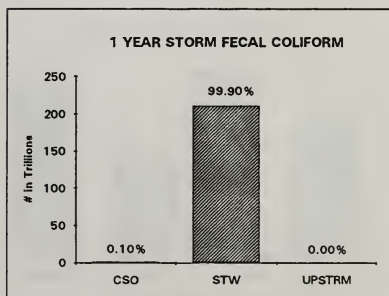
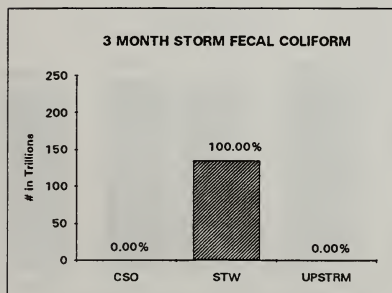
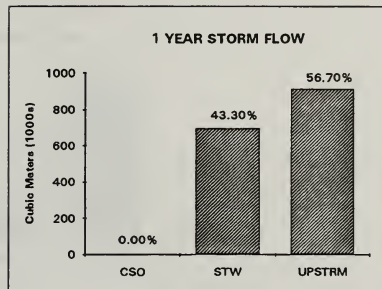
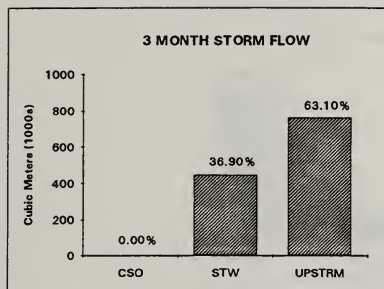
**FUTURE PLANNED FLOWS AND LOADS FOR THREE MONTH
AND ONE YEAR STORM EVENTS - ALEWIFE BROOK**



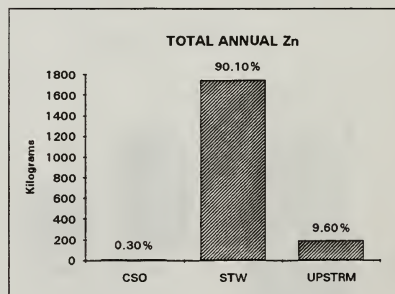
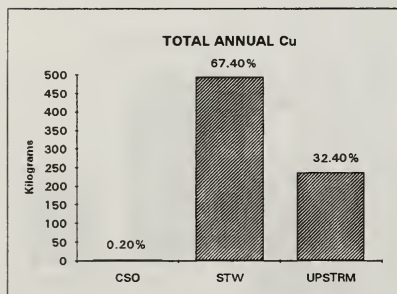
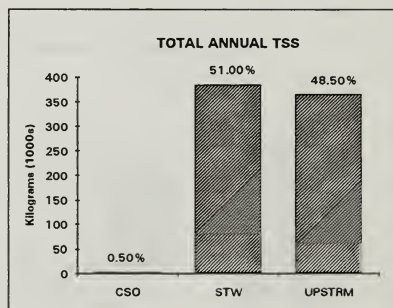
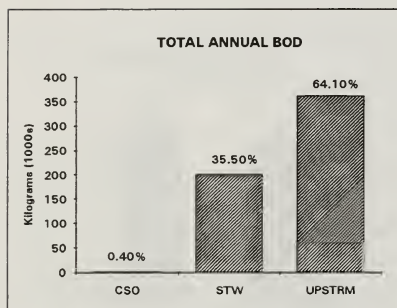
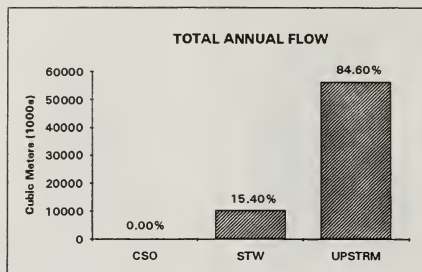
**FUTURE PLANNED ANNUAL FLOWS AND LOADS - ALEWIFE BROOK
FLOW, BIOCHEMICAL OXYGEN DEMAND, TOTAL SUSPENDED SOLIDS, COPPER, ZINC**



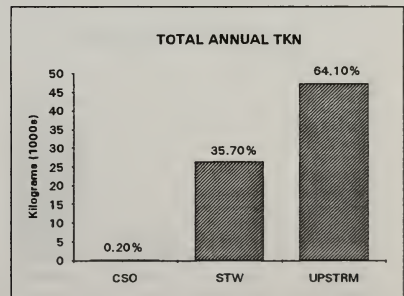
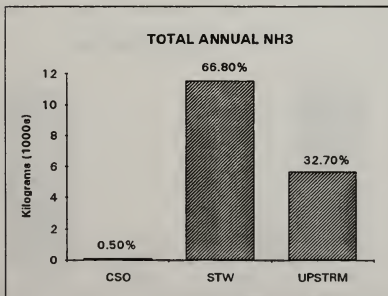
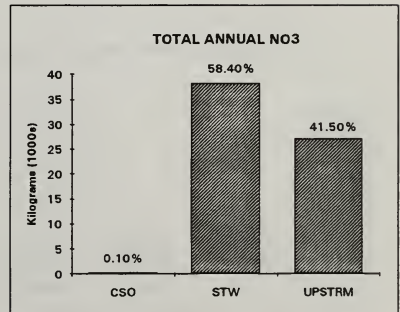
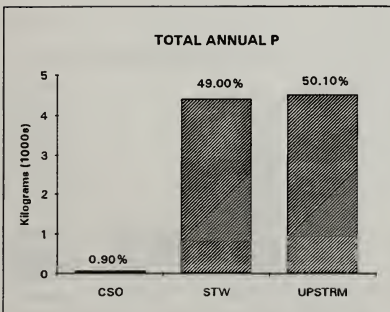
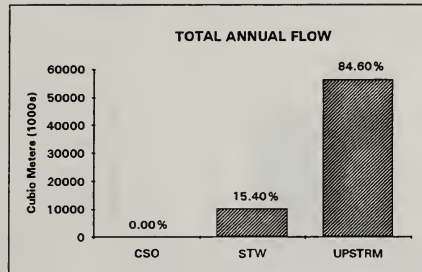
**FUTURE PLANNED ANNUAL FLOWS AND LOADS - ALEWIFE BROOK
FLOW, TOTAL PHOSPHORUS, NITRATE, AMMONIA, TOTAL KJELDAHL NITROGEN**



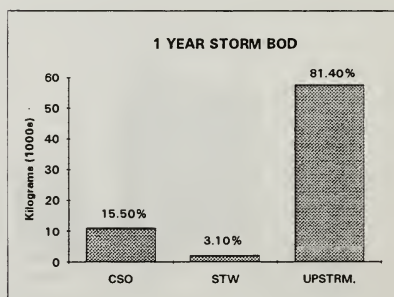
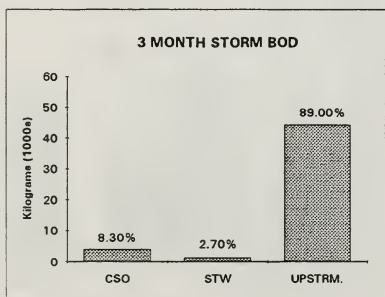
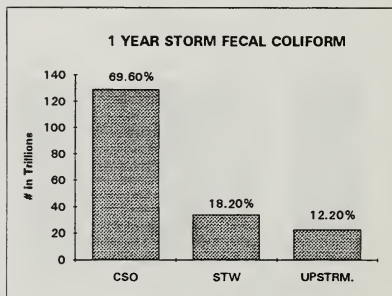
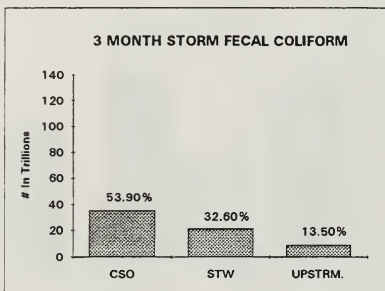
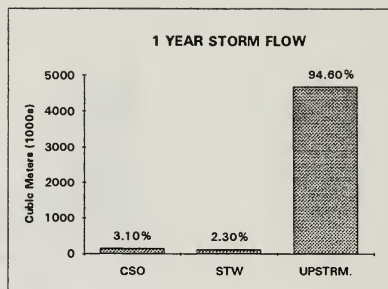
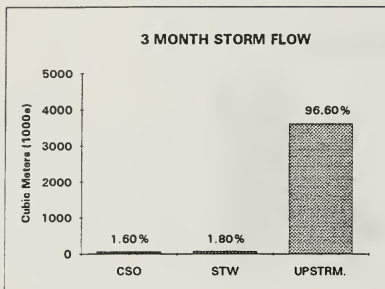
**FUTURE PLANNED FLOWS AND LOADS FOR THREE MONTH
AND ONE YEAR STORM EVENT - UPPER MYSTIC RIVER**



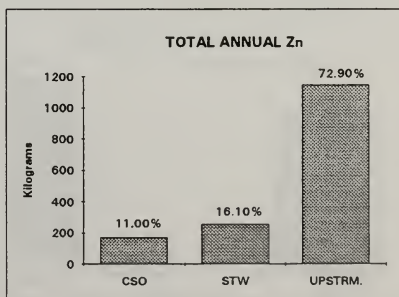
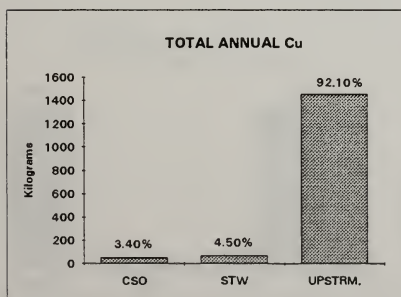
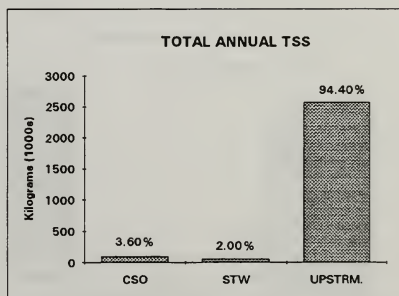
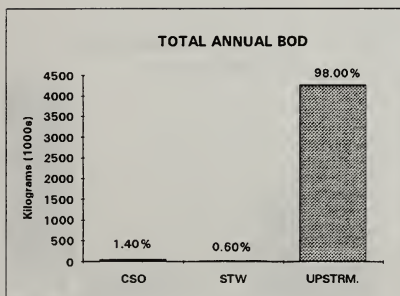
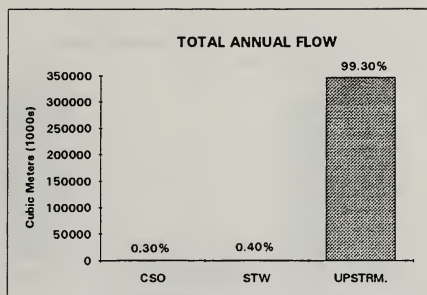
**FUTURE PLANNED ANNUAL FLOWS AND LOADS - UPPER MYSTIC RIVER
FLOWS, BIOCHEMICAL OXYGEN DEMAND, TOTAL SUSPENDED SOLIDS, COPPER, ZINC**



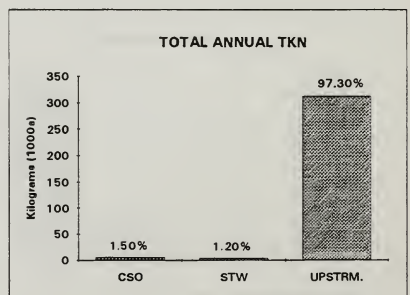
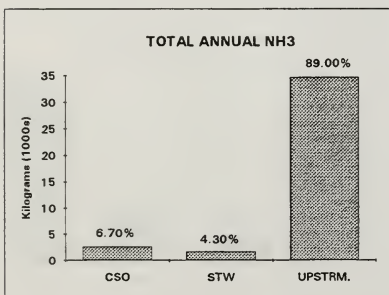
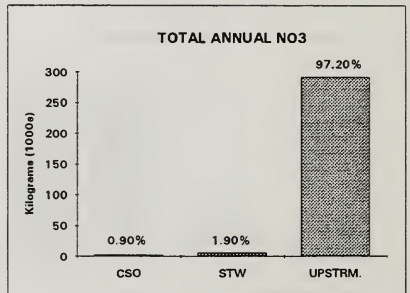
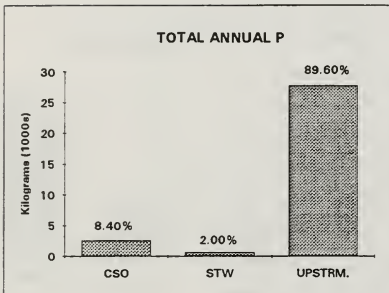
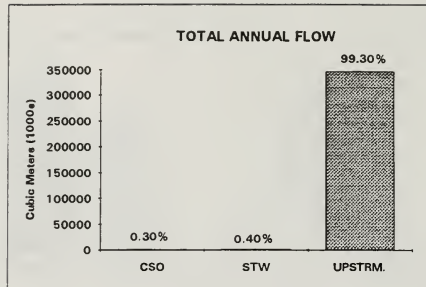
**FUTURE PLANNED ANNUAL FLOWS AND LOADS - UPPER MYSTIC RIVER
FLOWS, TOTAL PHOSPHORUS, NITRATE, AMMONIA, TOTAL KJELDAHL NITROGEN**



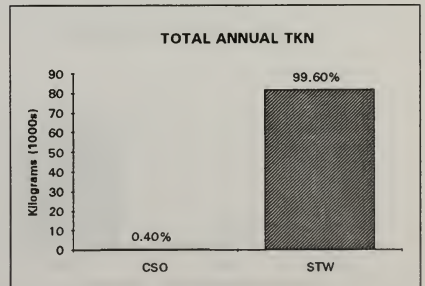
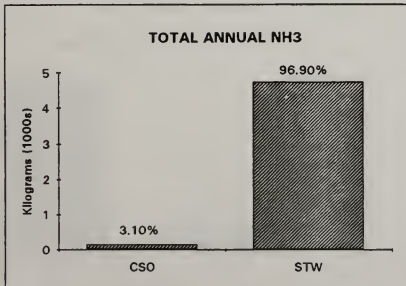
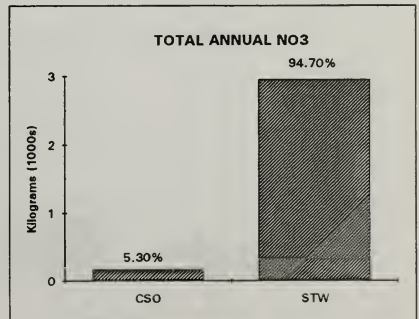
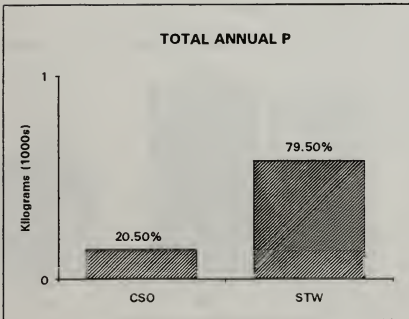
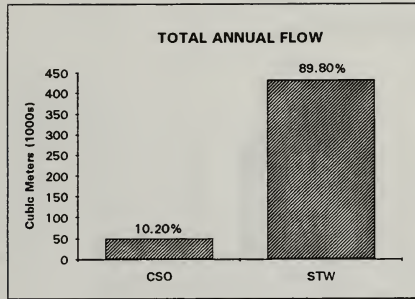
**FUTURE PLANNED FLOWS AND LOADS FOR THREE MONTH
AND ONE YEAR STORM EVENTS - UPPER INNER HARBOR**



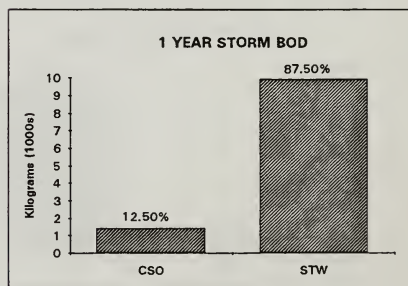
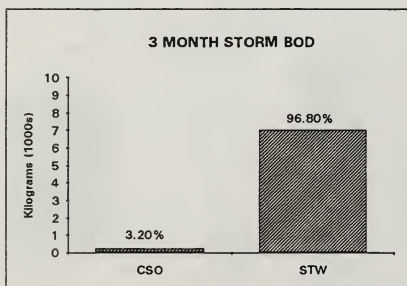
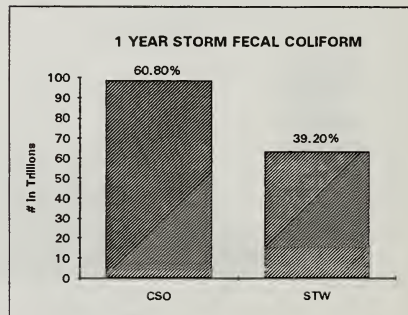
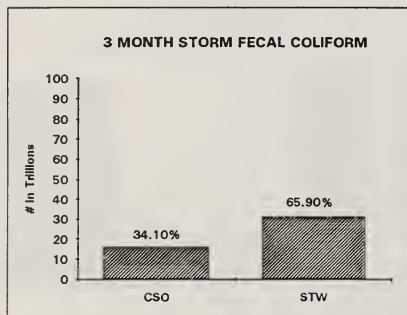
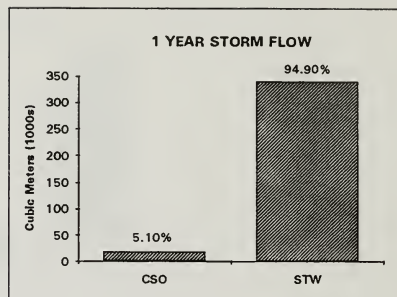
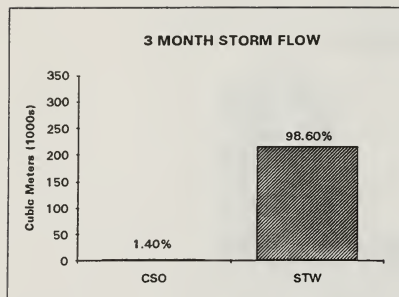
**FUTURE PLANNED ANNUAL FLOWS AND LOADS UPPER INNER HARBOR
FLOWS, BIOCHEMICAL OXYGEN DEMAND, TOTAL SUSPENDED SOLIDS, COPPER, ZINC**



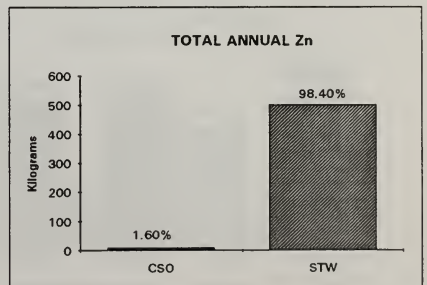
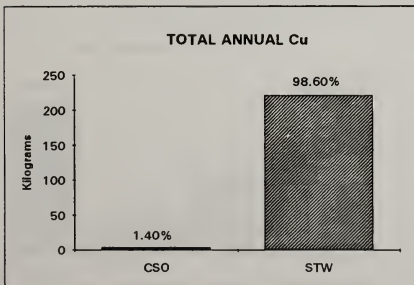
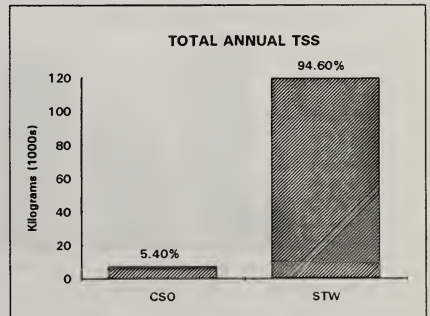
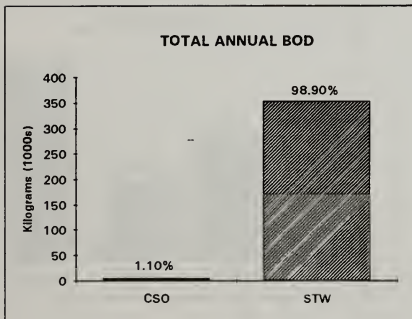
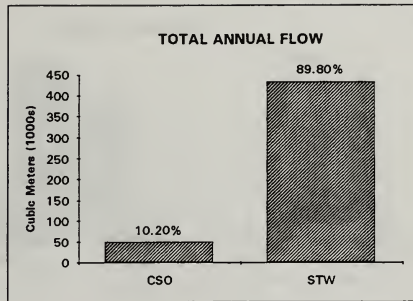
**FUTURE PLANNED ANNUAL FLOWS AND LOADS - UPPER INNER HARBOR
FLOWS, TOTAL PHOSPHORUS, NITRATE, AMMONIA, TOTAL KJELDAHL NITROGEN**



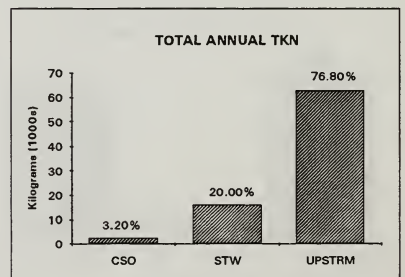
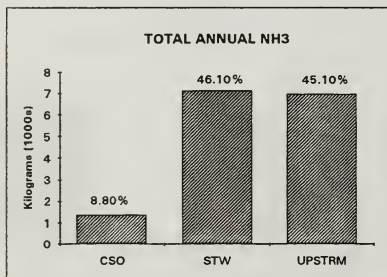
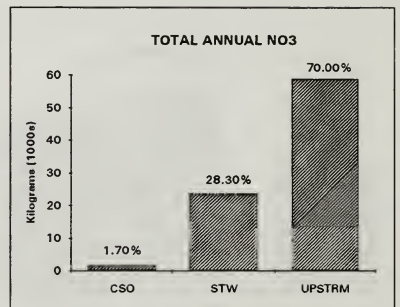
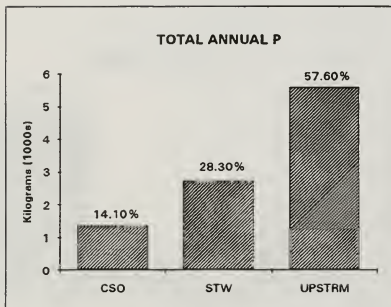
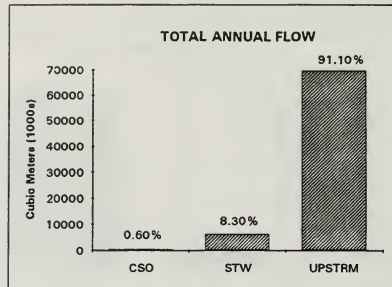
**FUTURE PLANNED ANNUAL FLOWS AND LOADS-LOWER INNER HARBOR
FLOW, TOTAL PHOSPHORUS, NITRATE, AMMONIA, TOTAL KJELDAHL NITROGEN**



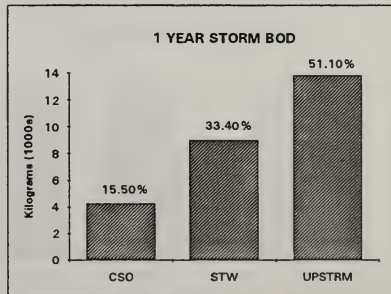
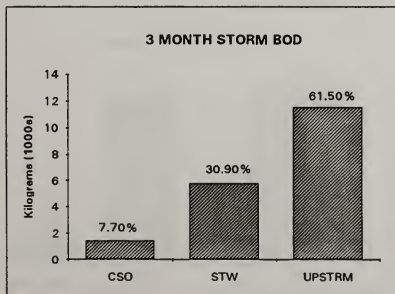
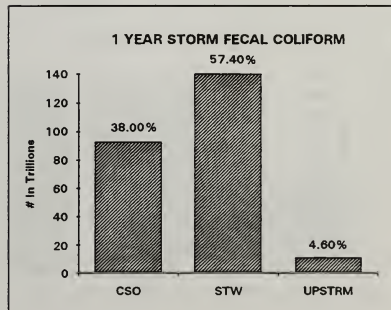
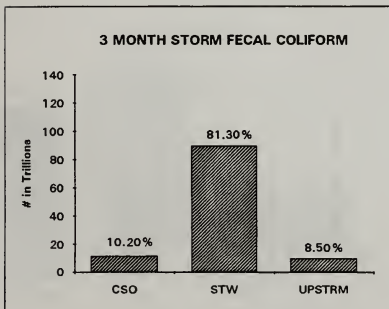
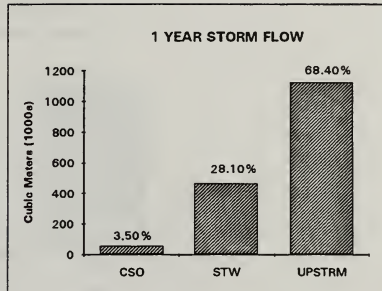
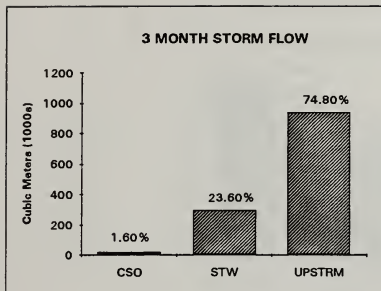
**FUTURE PLANNED FLOWS AND LOADS FOR THREE MONTH
AND ONE YEAR STORM EVENTS - LOWER INNER HARBOR**



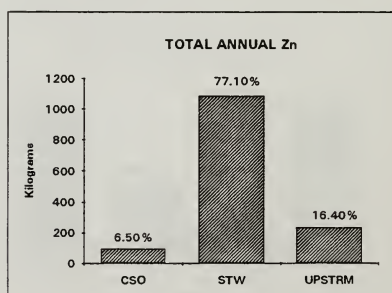
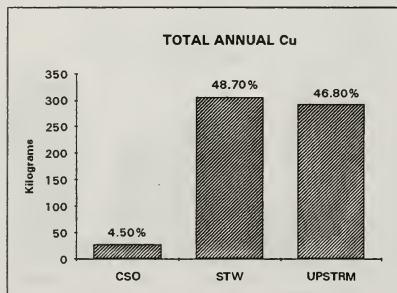
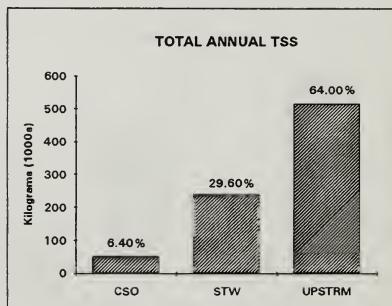
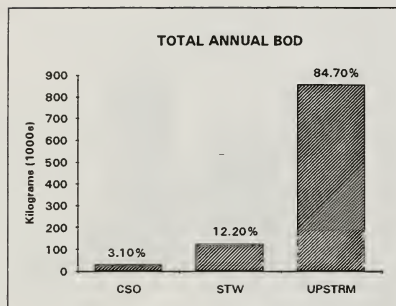
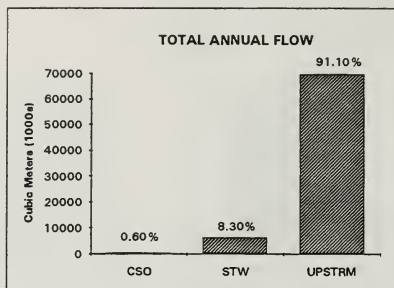
**FUTURE PLANNED ANNUAL FLOWS AND LOADS - LOWER INNER HARBOR
FLOW, BIOCHEMICAL OXYGEN DEMAND, TOTAL SUSPENDED SOLIDS, COPPER, ZINC**



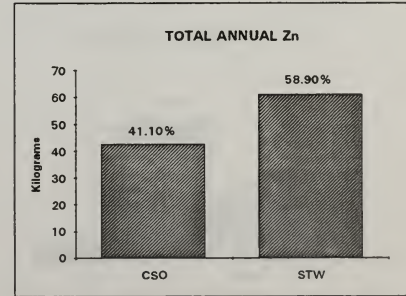
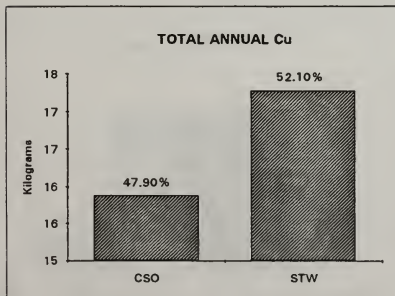
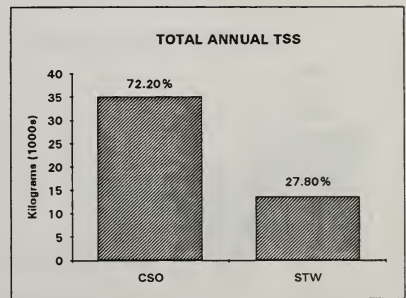
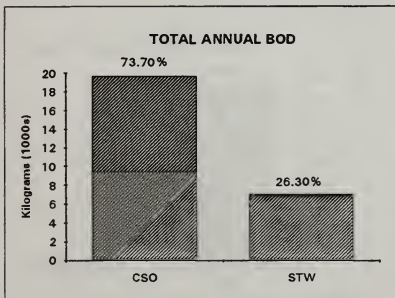
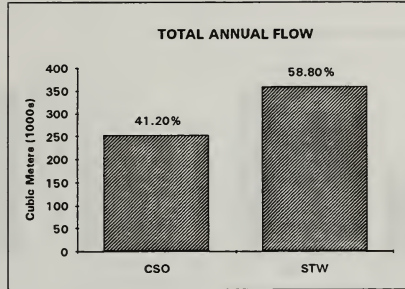
**FUTURE PLANNED ANNUAL FLOWS AND LOADS - MYSTIC /CHELSEA CONFLUENCE
FLOWS, TOTAL PHOSPHORUS, NITRATE, AMMONIA, TOTAL KJELDAHL NITROGEN**



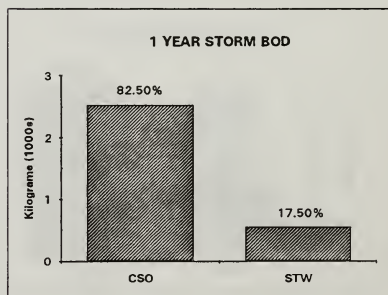
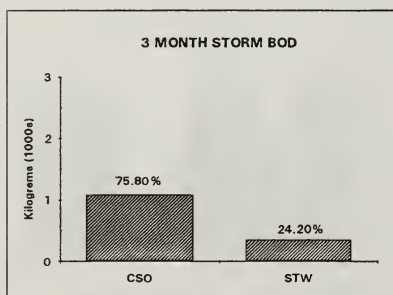
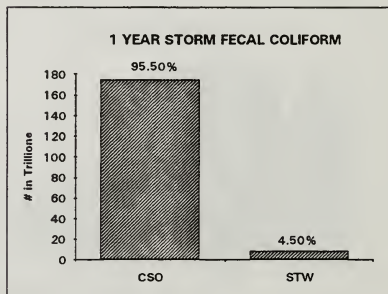
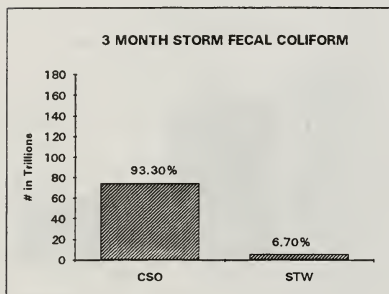
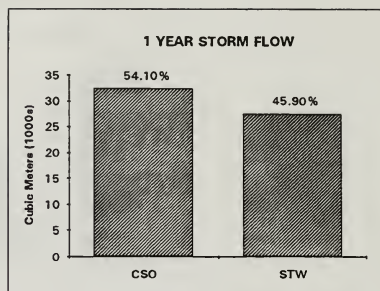
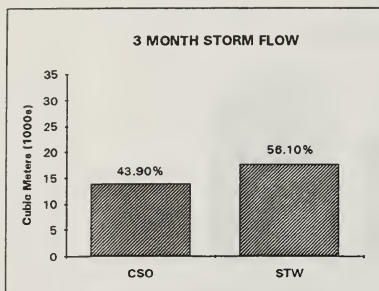
**FUTURE PLANNED FLOWS AND LOADS FOR THREE MONTH
AND ONE YEAR STORM EVENTS - MYSTIC RIVER/CHELSEA CREEK CONFLUENCE**



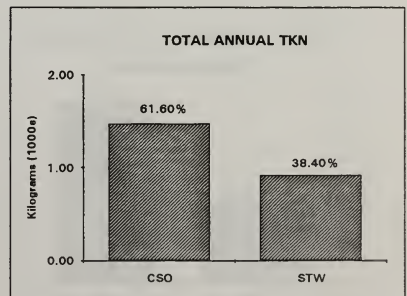
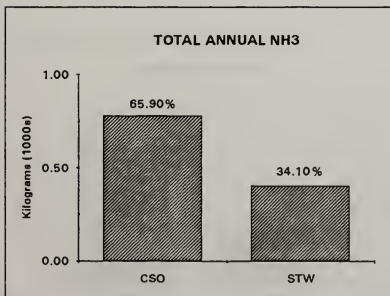
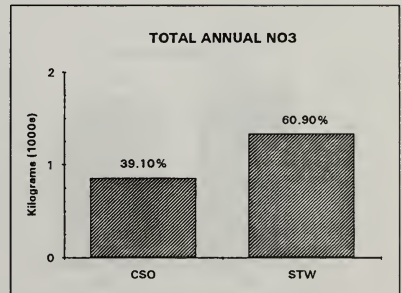
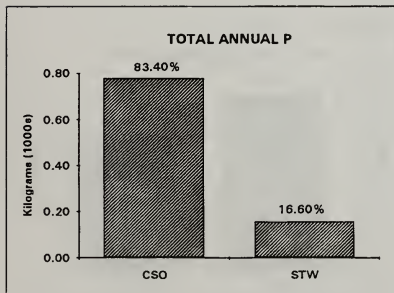
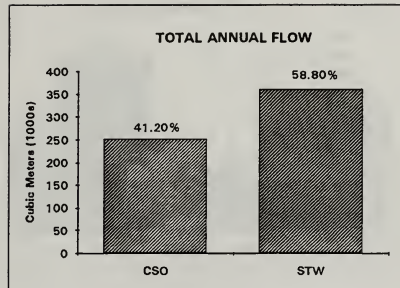
**FUTURE PLANNED ANNUAL FLOWS AND LOADS - MYSTIC /CHELSEA CONFLUENCE
FLOWS, BIOCHEMICAL OXYGEN DEMAND, TOTAL SUSPENDED SOLIDS, COPPER, ZINC**



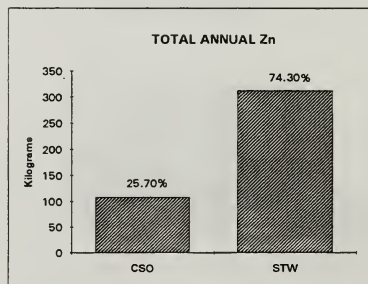
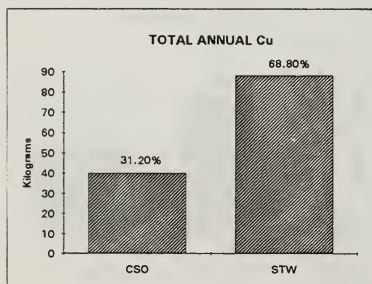
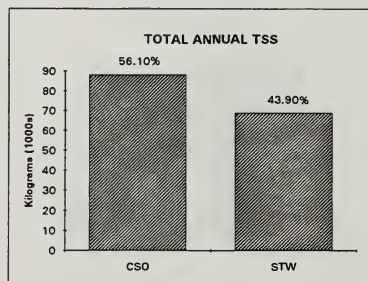
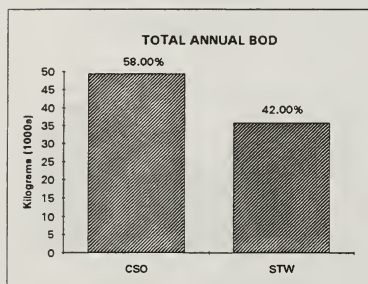
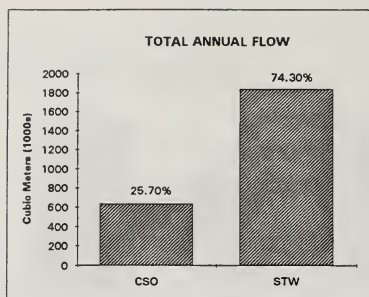
**FUTURE PLANNED ANNUAL FLOWS AND LOADS - RESERVED CHANNEL
FLOWS, BIOCHEMICAL OXYGEN DEMAND, TOTAL SUSPENDED SOLIDS, COPPER, ZINC**



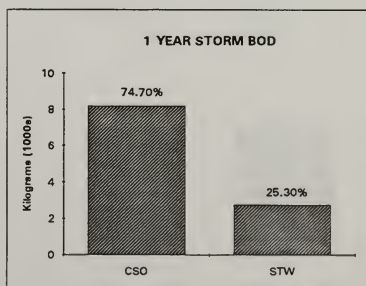
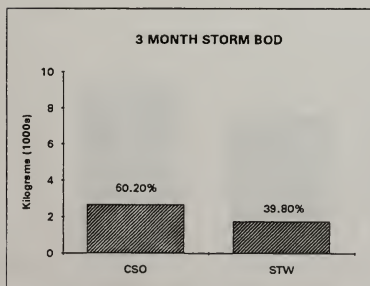
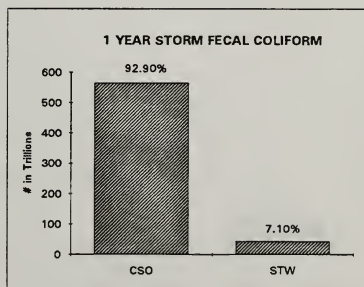
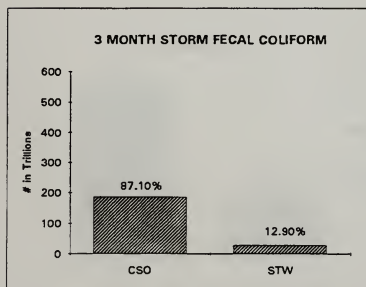
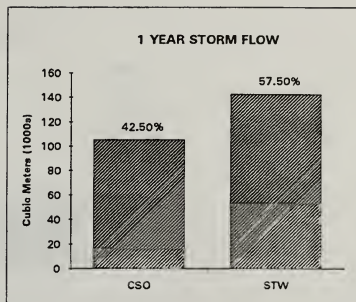
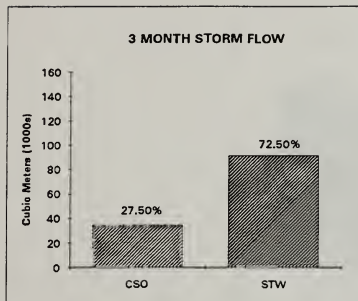
**FUTURE PLANNED FLOWS AND LOADS FOR THREE MONTH
AND ONE YEAR STORM EVENTS - RESERVED CHANNEL**



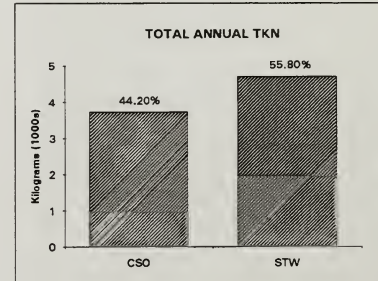
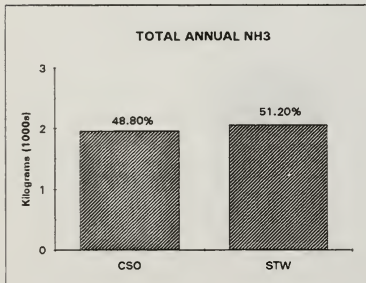
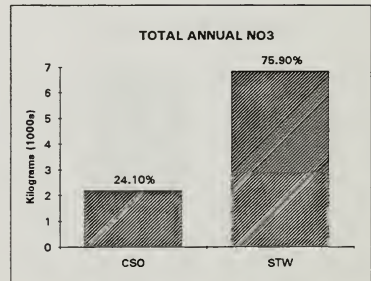
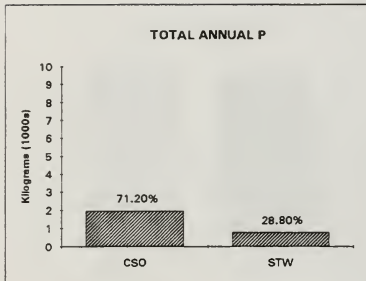
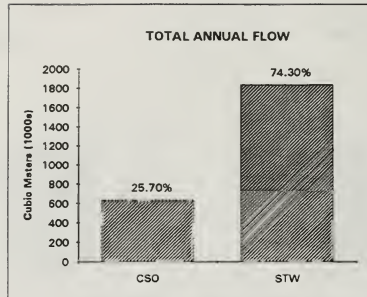
**FUTURE PLANNED ANNUAL FLOWS AND LOADS - RESERVED CHANNEL
FLOWS, TOTAL PHOSPHORUS, NITRATE, AMMONIA, TOTAL KJELDAHL NITROGEN**



**FUTURE PLANNED ANNUAL FLOWS AND LOADS - FORT POINT CHANNEL
FLOW, BIOCHEMICAL OXYGEN DEMAND, TOTAL SUSPENDED SOLIDS, COPPER, ZINC**



**FUTURE PLANNED FLOWS AND LOADS FOR THREE MONTH
AND ONE YEAR STORM EVENTS - FORT POINT CHANNEL**



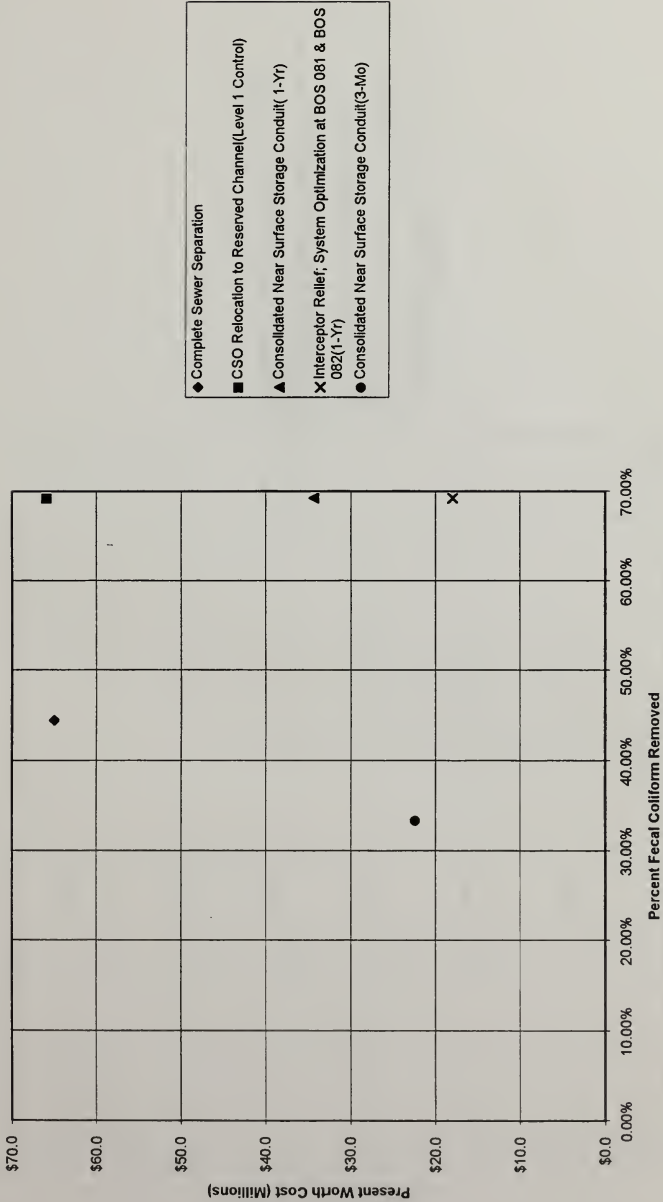
**FUTURE PLANNED ANNUAL FLOWS AND LOADS - FORT POINT CHANNEL
FLOW, TOTAL PHOSPHORUS, NITRATE, AMMONIA, TOTAL KJELDAHL NITROGEN**

VOLUME TWO

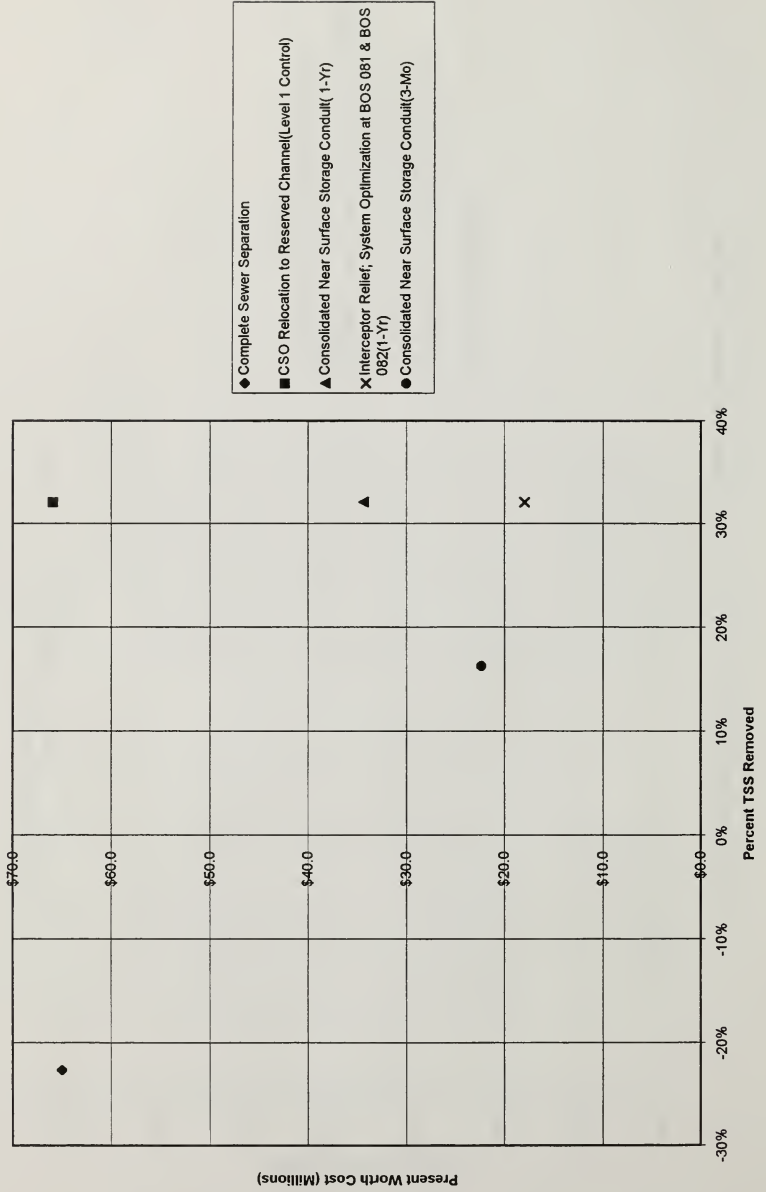
APPENDIX B

COST PERFORMANCE CURVES

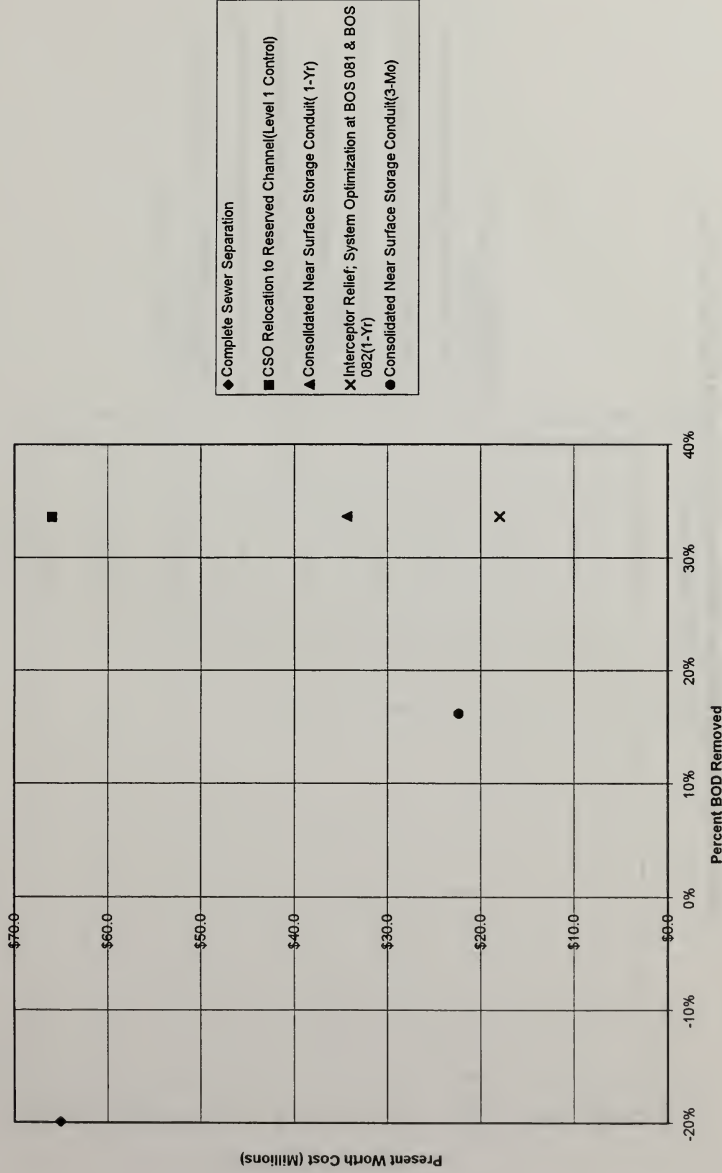
North Dorchester Bay Total Load Reductions as a Percent of Baseline Total Load
(1-Year Storm)



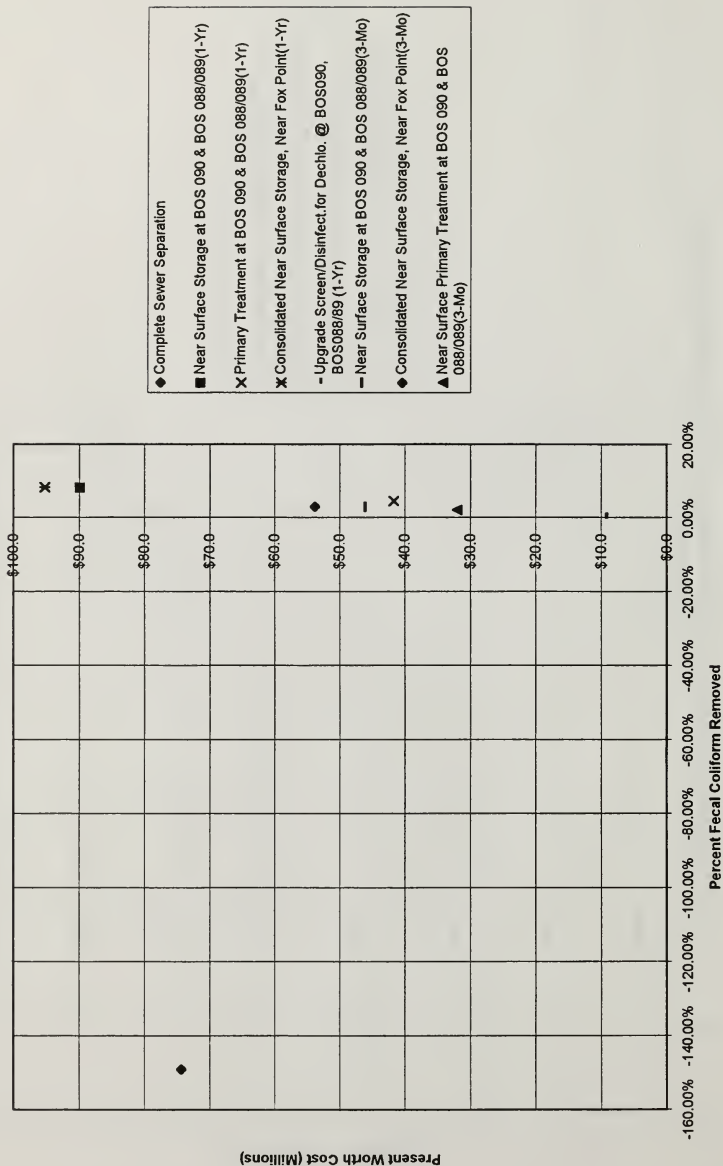
North Dorchester Bay Total Load Reductions as a Percent of Baseline Total Load
(1-Year Storm)



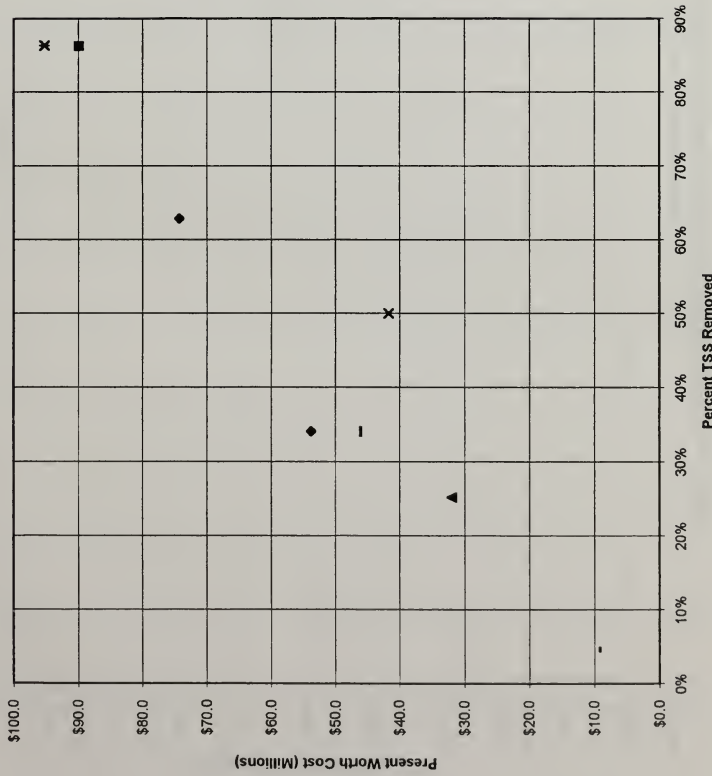
North Dorchester Bay Total Load Reductions as a Percent of Baseline Total Load
(1-Year Storm)



South Dorchester Bay Total Load Reductions as a Percent of Baseline Total Load (1-Year Storm)

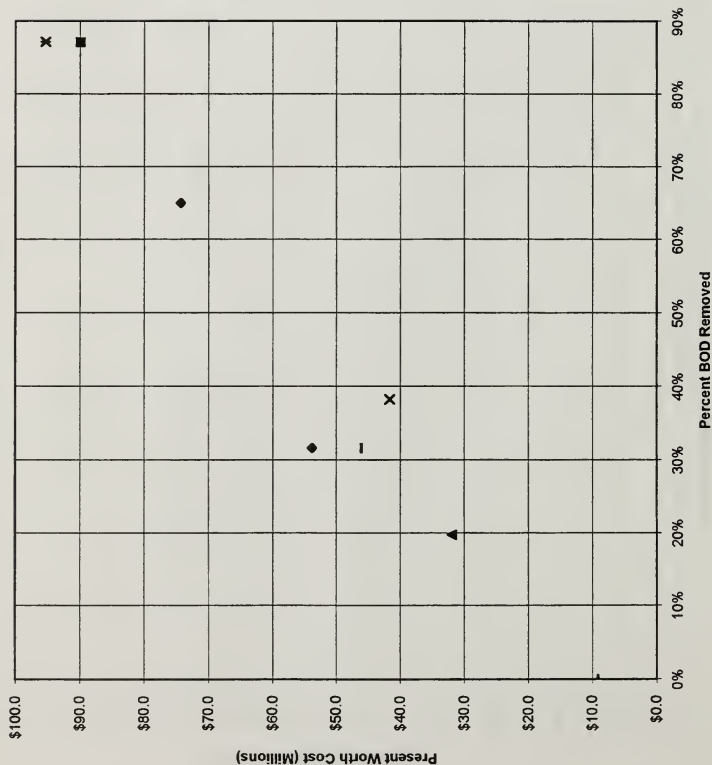


South Dorchester Bay Total Load Reductions as a Percent of Baseline Total Load
(1-Year Storm)



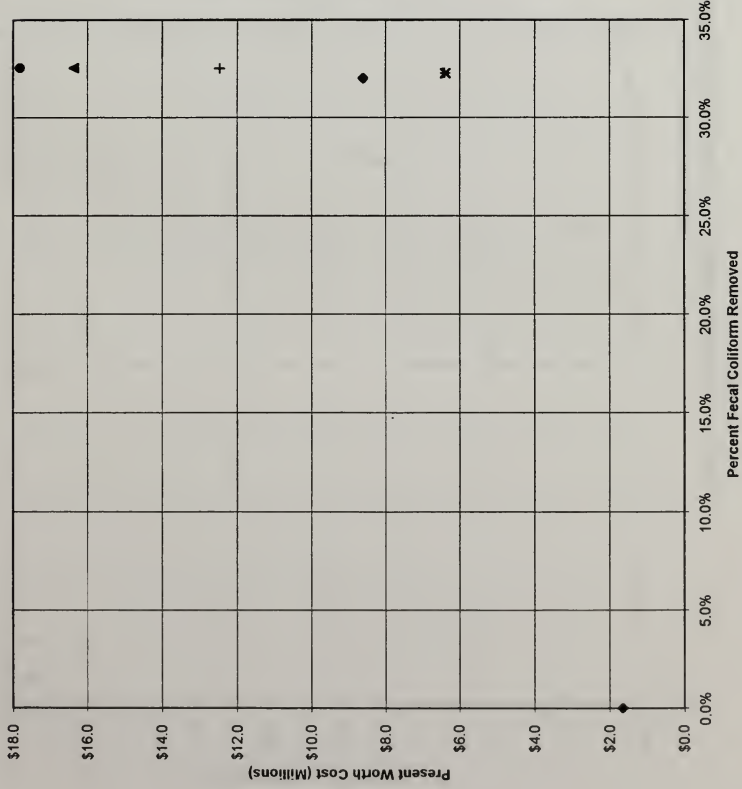
- ◆ Complete Sewer Separation
- Near Surface Storage at BOS 090 & BOS 088/089 (1-Yr)
- ✕ Primary Treatment at BOS 090 & BOS 088/089 (1-Yr)
- ✕ Consolidated Near Surface Storage, Near Fox Point (1-Yr)
- Upgrade Screen/Disinfect. for Dechlor. @ BOS090, BOS088/89 (1-Yr)
- Near Surface Storage at BOS 090 & BOS 088/089 (3-Mo)
- ◆ Consolidated Near Surface Storage, Near Fox Point (3-Mo)
- ▲ Near Surface Primary Treatment at BOS 090 & BOS 088/089 (3-Mo)

South Dorchester Bay Total Load Reductions as a Percent of Baseline Total Load
(1-Year Storm)



- ◆ Complete Sewer Separation
- Near Surface Storage at BOS 090 & BOS 088/089 (1-Yr)
- ✕ Primary Treatment at BOS 090 & BOS 088/089 (1-Yr)
- ✕ Consolidated Near Surface Storage, Near Fox Point (1-Yr)
- Upgrade Screen/Disinfect for Dechlor. @ BOS 090, BOS 088/89 (1-Yr)
- Near Surface Storage at BOS 090 & BOS 088/089 (3-Mo)
- ◆ Consolidated Near Surface Storage, Near Fox Point (3-Mo)
- ▲ Near Surface Primary Treatment at BOS 090 & BOS 088/089 (3-Mo)

Neponset River Total Load Reductions as a Percent of Baseline Total Load (1-Year Storm)



◆ Complete Sewer Separation

▲ Primary Treatment, Near BOS 093(1-Yr)

✱ Individual Screen/Disinfect /Dechl. at BOS 095 & BOS 093(1-Yr)

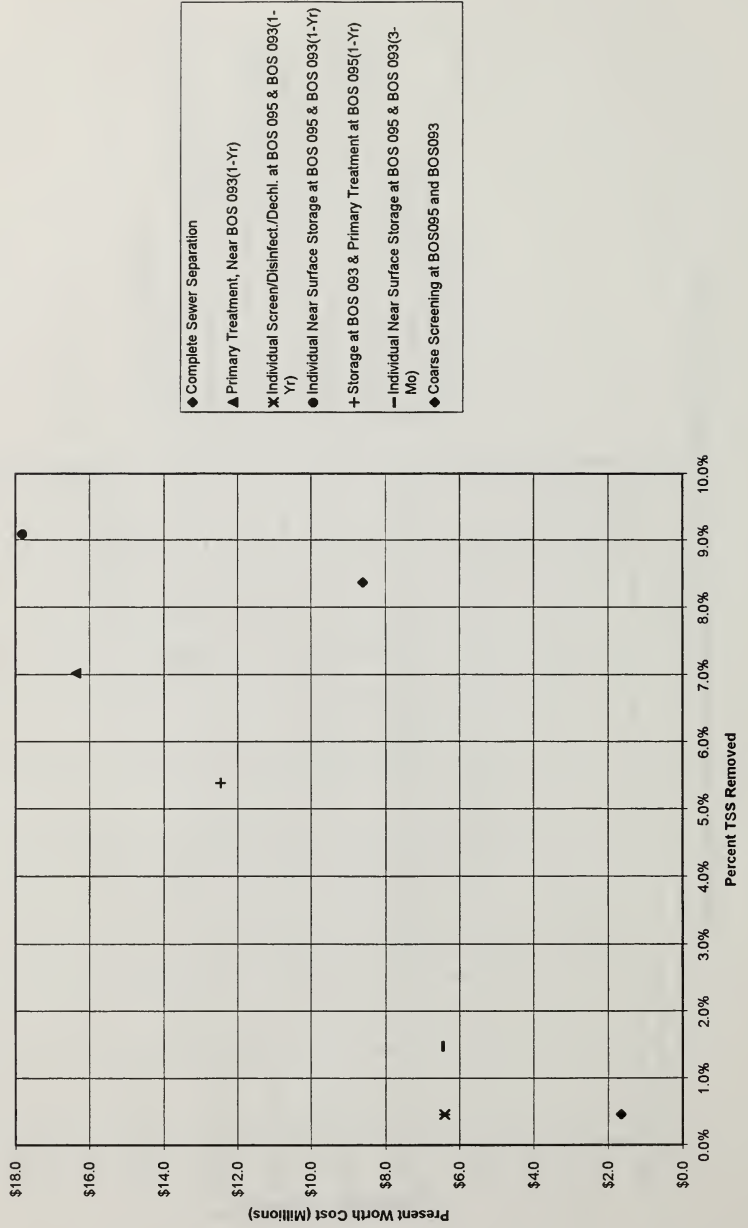
● Individual Near Surface Storage at BOS 095 & BOS 093(1-Yr)

+ Storage at BOS 093 & Primary Treatment at BOS 095(1-Yr)

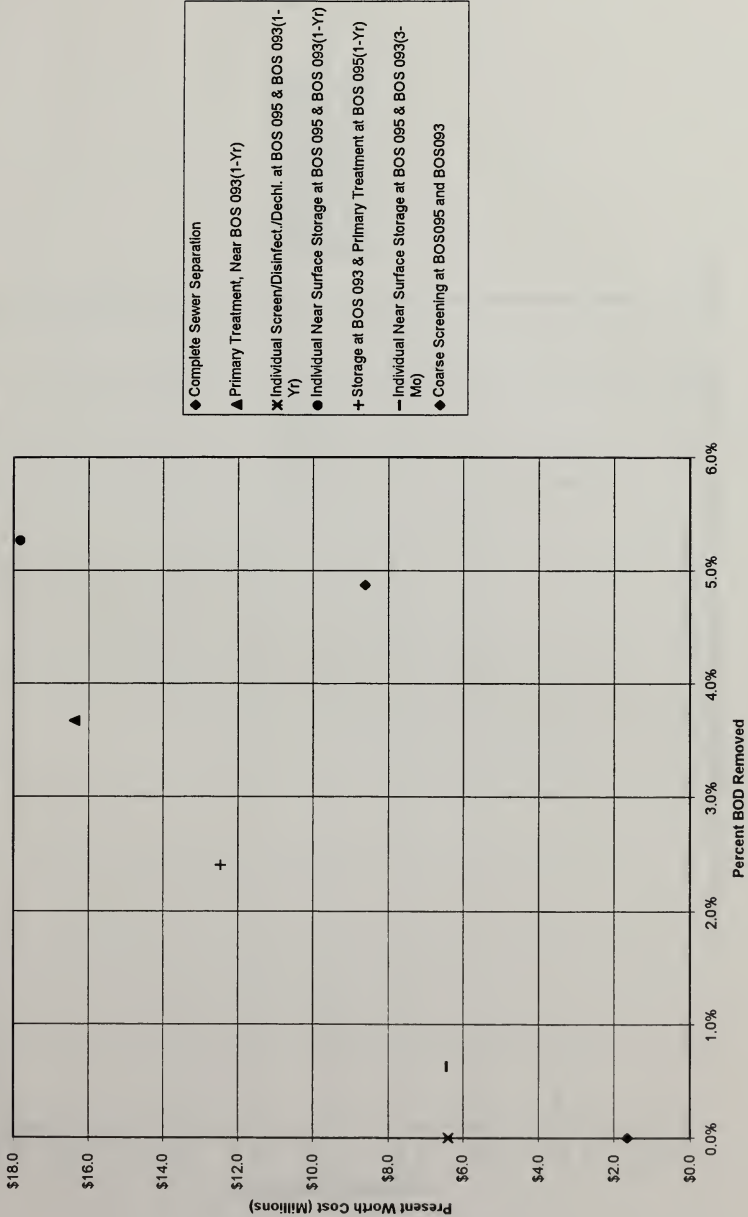
— Individual Near Surface Storage at BOS 095 & BOS 093(3-Mo)

◆ Coarse Screening at BOS095 and BOS093

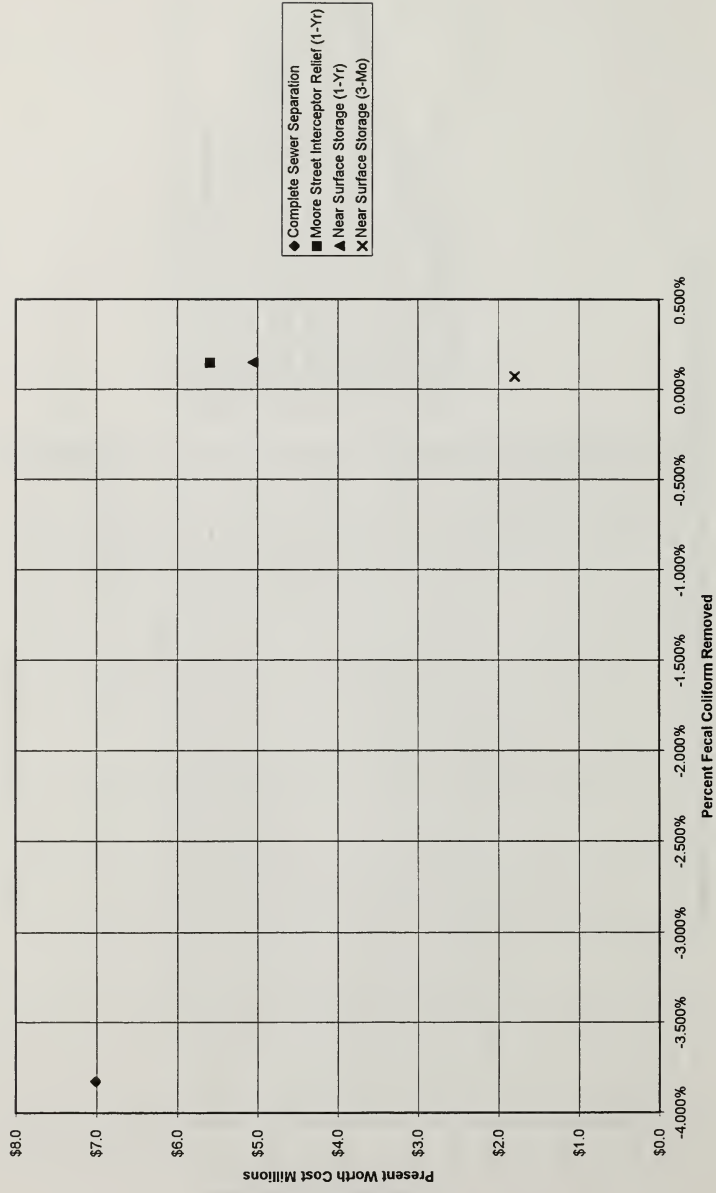
Neponset River Total Load Reductions as a Percent of Baseline Total Load
(1-Year Storm)



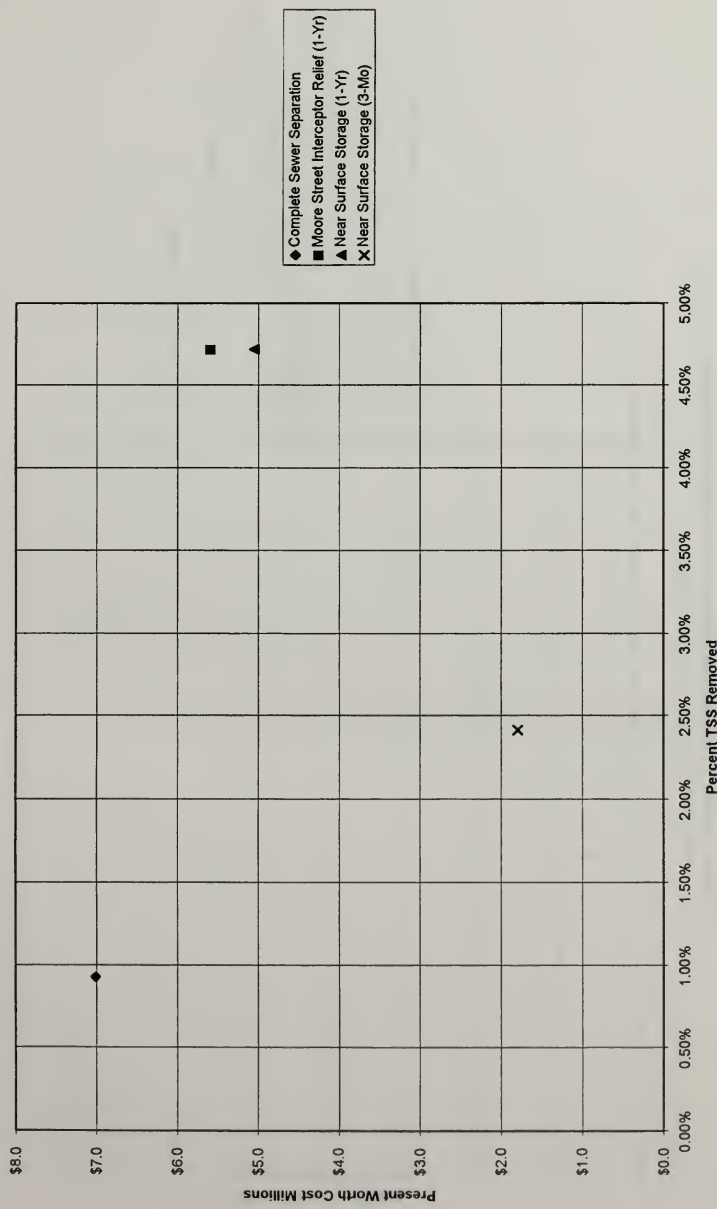
Neponset River Total Load Reductions as a Percent of Baseline Total Load
(1-Year Storm)



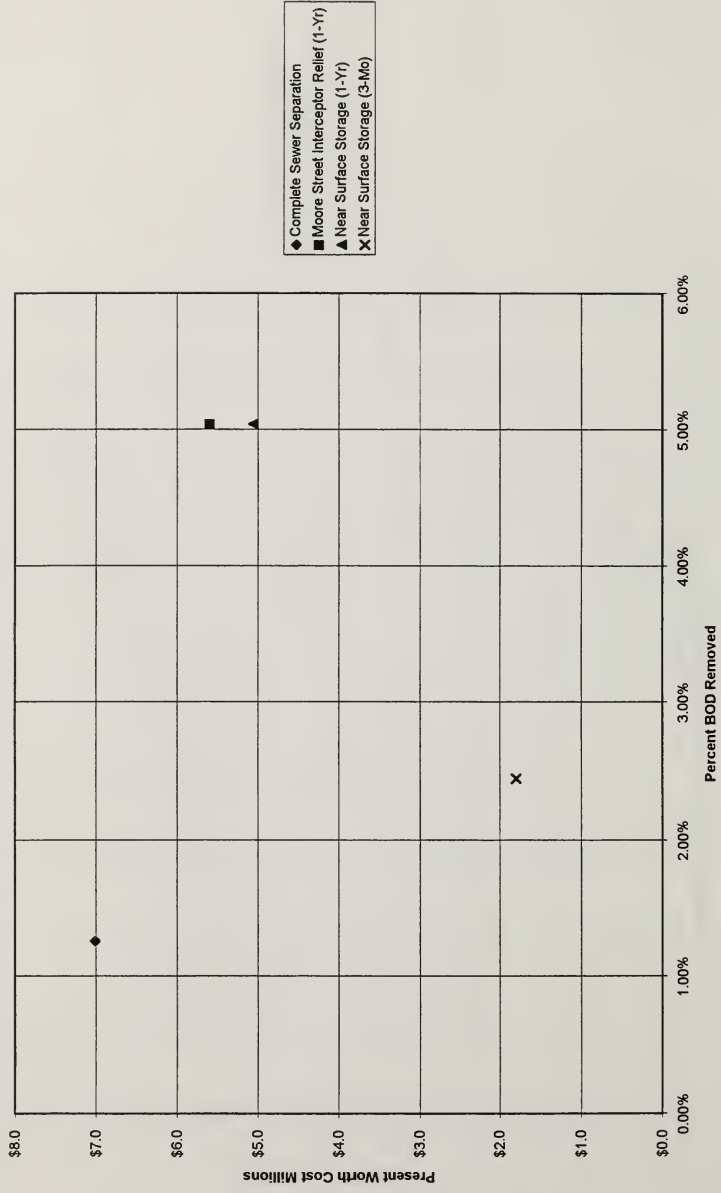
Constitution Beach Total Load Reductions as a Percent of Baseline Total Load
(1-Year Storm)



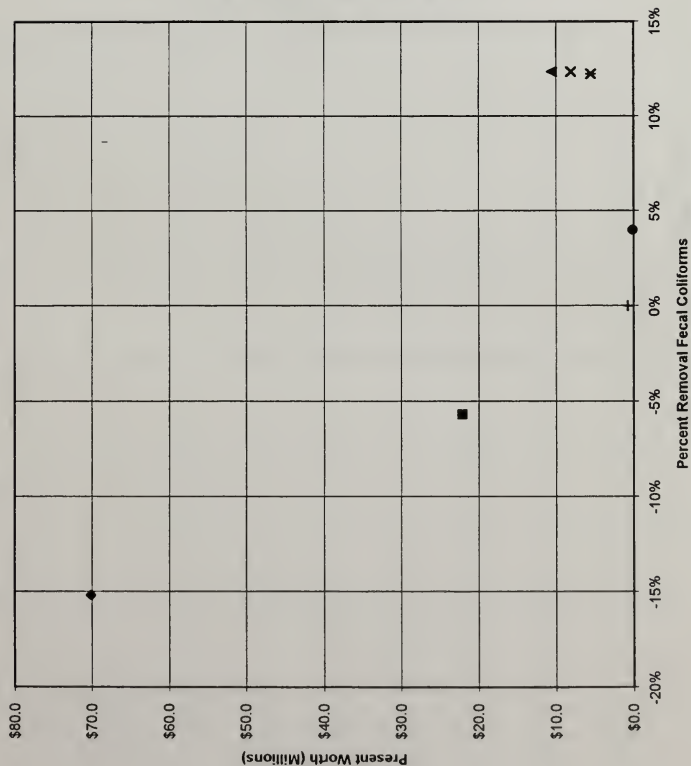
Constitution Beach Total Load Reductions as a Percent of Baseline Total Load
(1-Year Storm)



Constitution Beach Total Load Reductions as a Percent of Baseline Total Load
(1-Year Storm)



Upper Charles Total Load Reductions as a Percent of Baseline Total Load
(1-Year Storm)



◆ Complete Sewer Separation

■ Sewer Separation at CAM005, CAM009 & BOS032

▲ Storage at CAM005, CAM009 & Enlarge Int. Conn. @BOS032 (1-Yr)

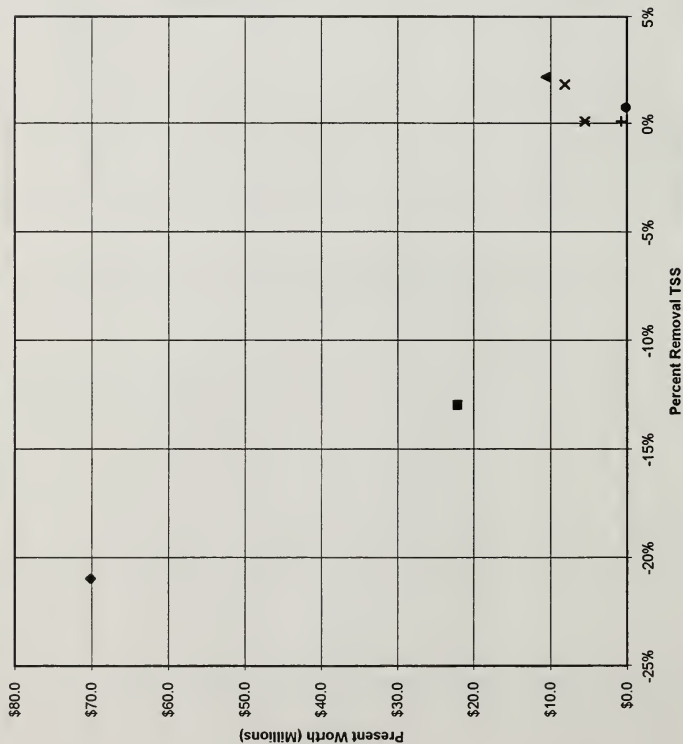
✕ Primary Treat. at CAM005 & BOS032; Storage at CAM009 (1-Yr)

✕ Less Than Primary Treat. at CAM005, CAM009 & BOS032 (1-Yr)

● Screening at CAM005, CAM009 and Enlarge Int. Conn. at BOS032 (3-Mo)

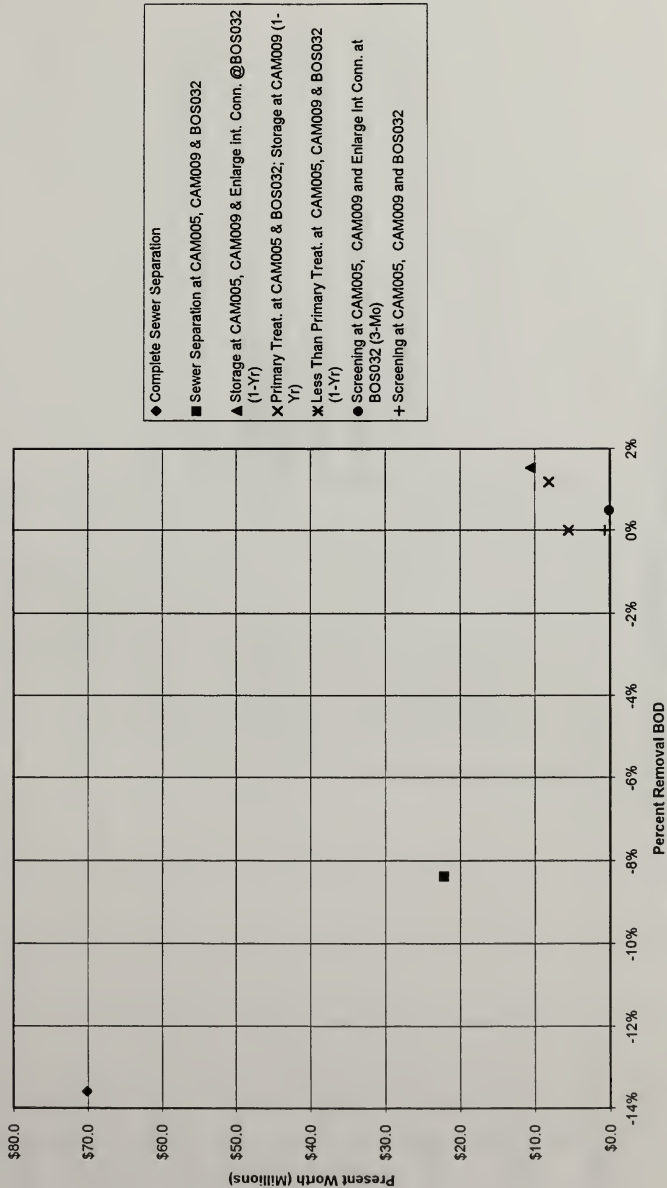
+ Screening at CAM005, CAM009 and BOS032

Upper Charles Total Load Reductions as a Percent of Baseline Total Load
(1-Year Storm)

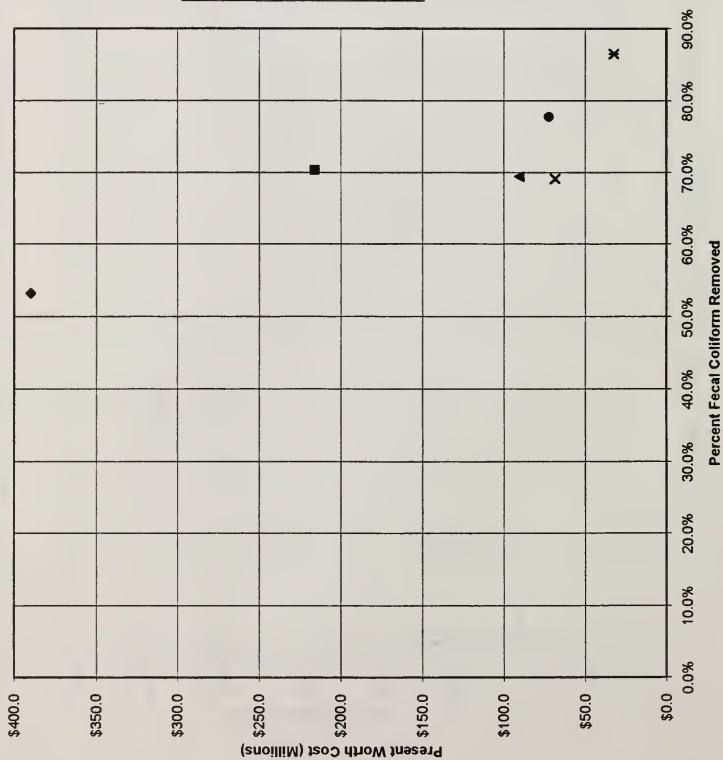


- ◆ Complete Sewer Separation
- Sewer Separation at CAM005, CAM009 & BOS032
- ▲ Storage at CAM005, CAM009 & Enlarge Int. Conn. @ BOS032 (1-yr)
- ✕ Primary Treat. at CAM005 & BOS032; Storage at CAM009 (1-yr)
- ✕ Less Than Primary Treat. at CAM005, CAM009 & BOS032 (1-yr)
- Screening at CAM005, CAM009 and Enlarge Int Conn. at BOS032 (3-Mo)
- + Screening at CAM005, CAM009 and BOS032

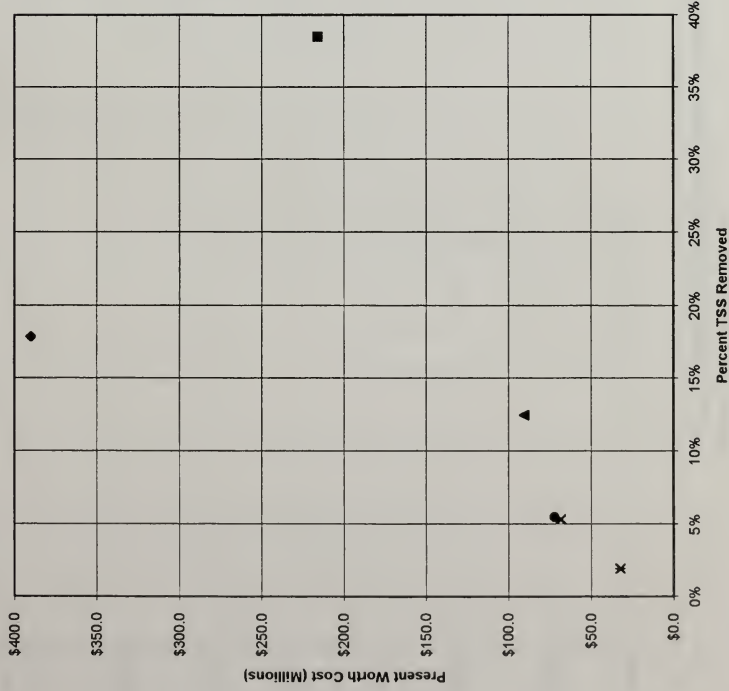
Upper Charles Total Load Reductions as a Percent of Baseline Total Load
(1-Year Storm)



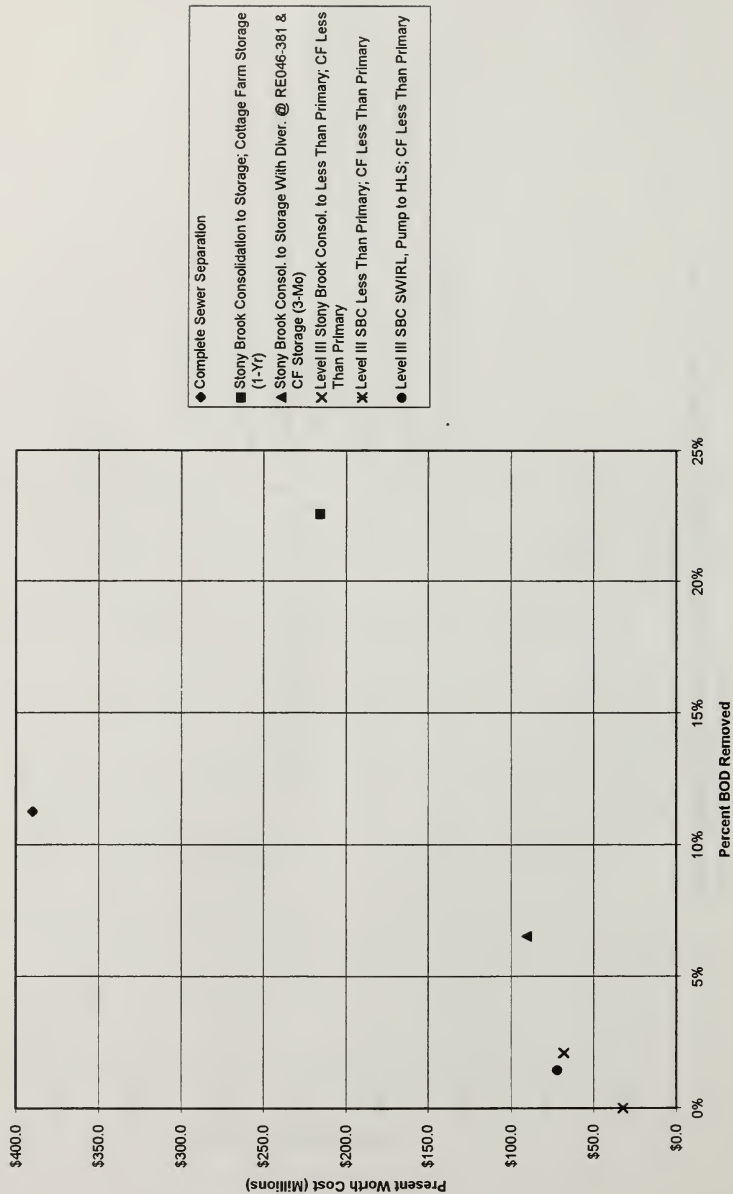
Lower Charles Total Load Reductions as a Percent of Baseline Total Load
(1-Year Storm)



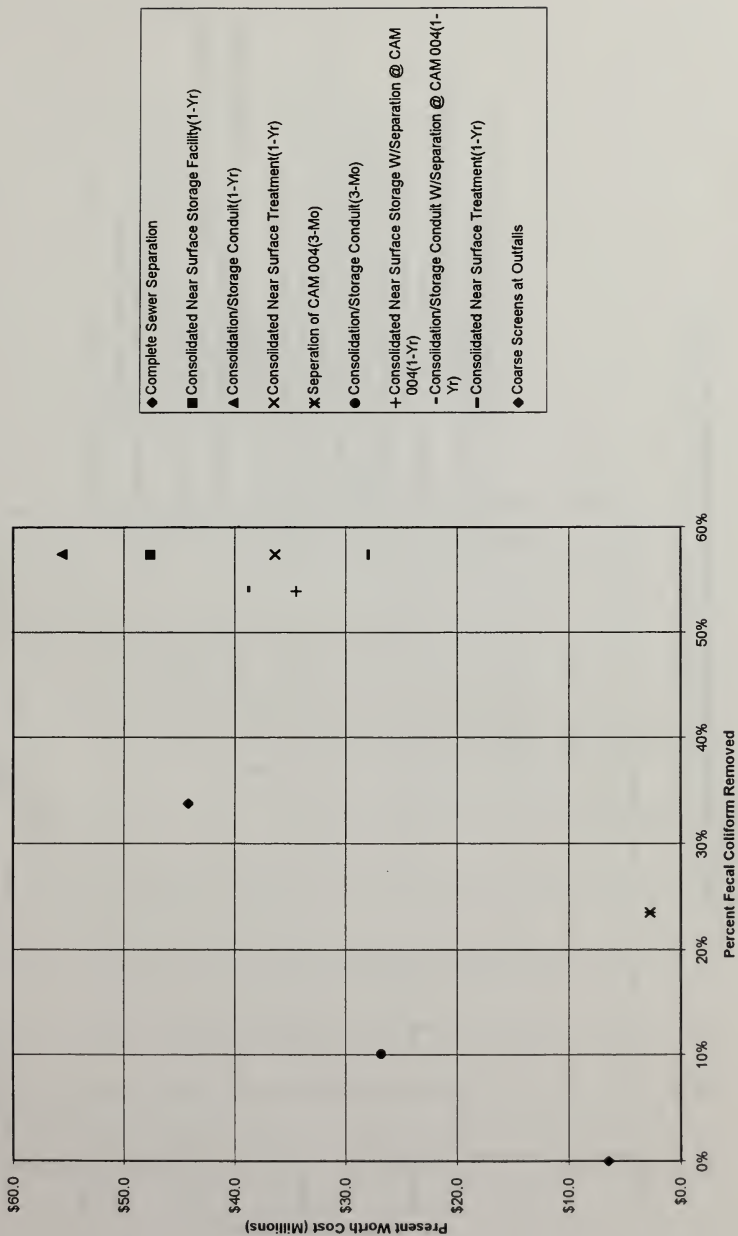
Lower Charles Total Load Reductions as a Percent of Baseline Total Load (1-Year Storm)



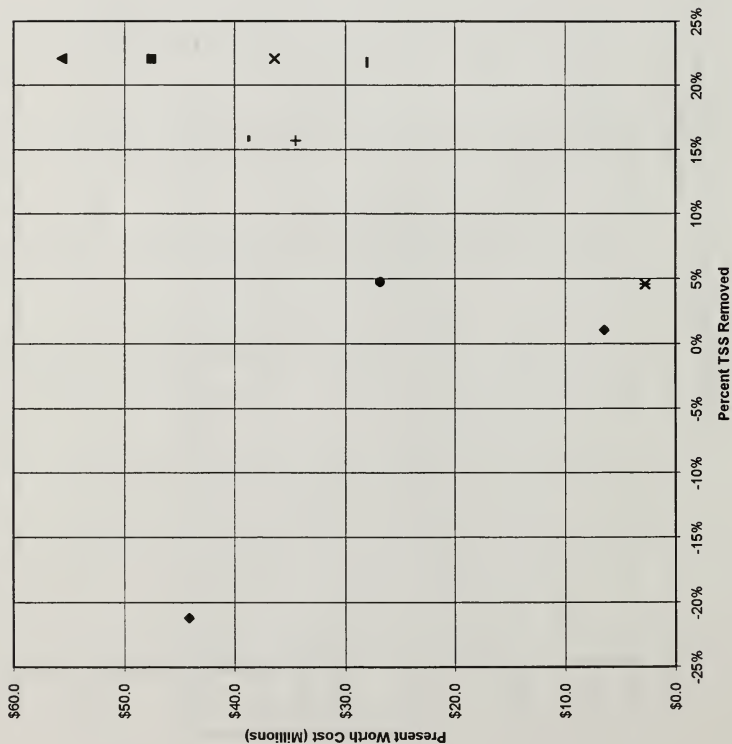
Lower Charles Total Load Reductions as a Percent of Baseline Total Load
(1-Year Storm)



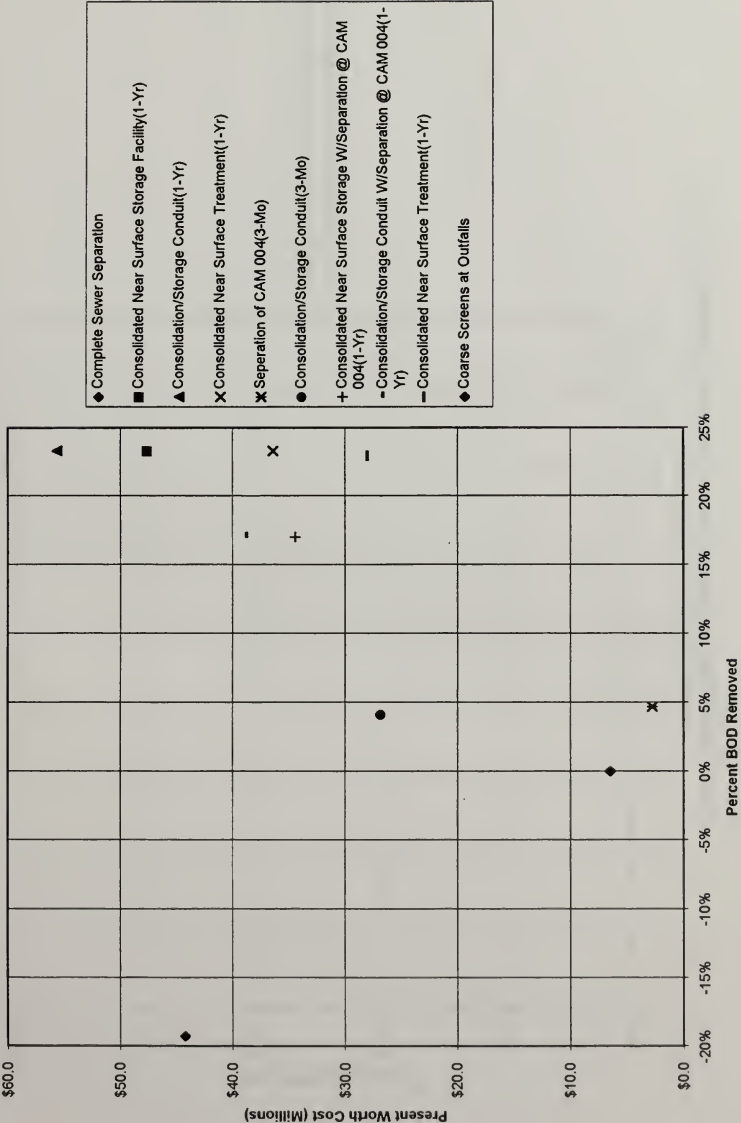
Alewife Total Load Reductions as a Percent of Baseline Total Load
 (1-Year Storm)



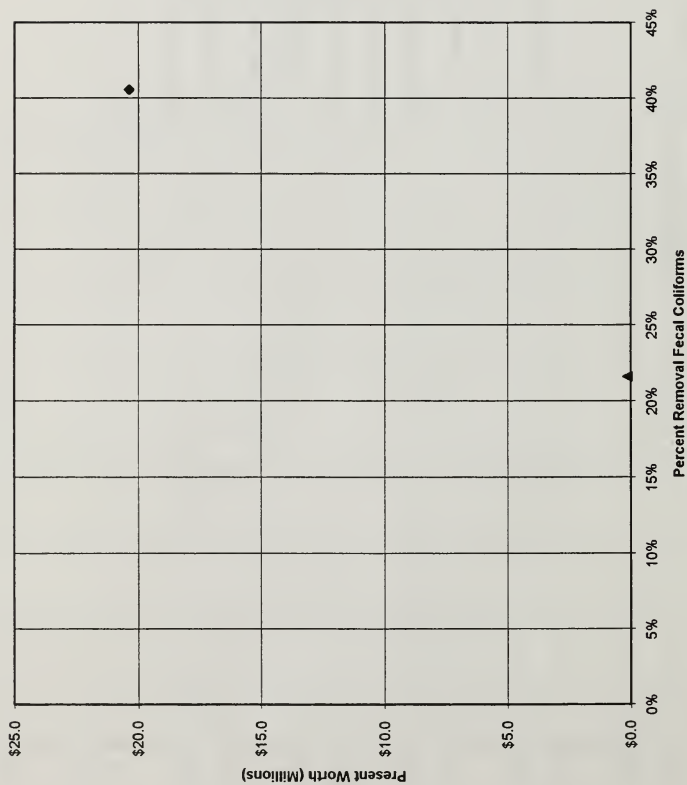
Alewife Total Load Reductions as a Percent of Baseline Total Load
(1-Year Storm)



Alewife Total Load Reductions as a Percent of Baseline Total Load
(1-Year Storm)

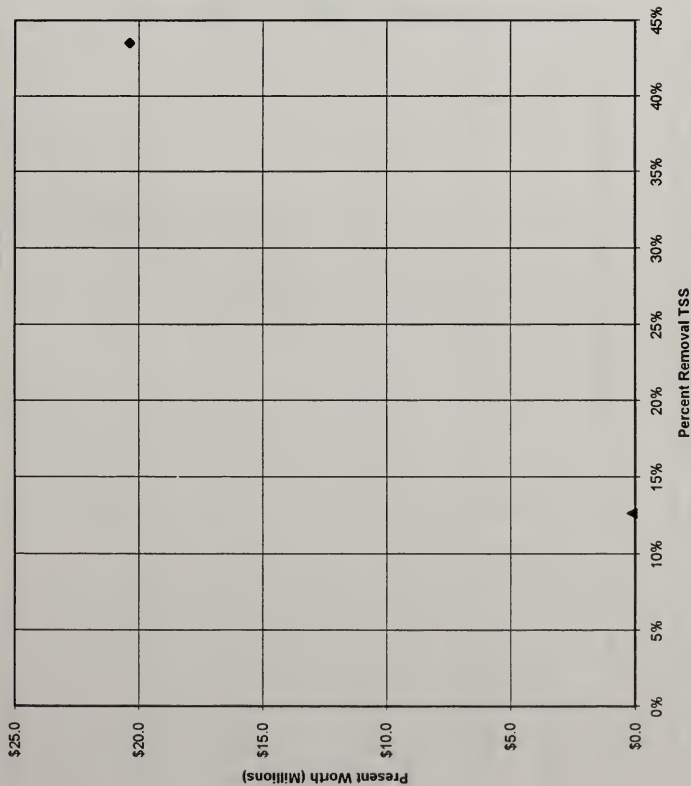


Upper Mystic Total Load Reductions as a Percent of Baseline Total Load (1-Year Storm)



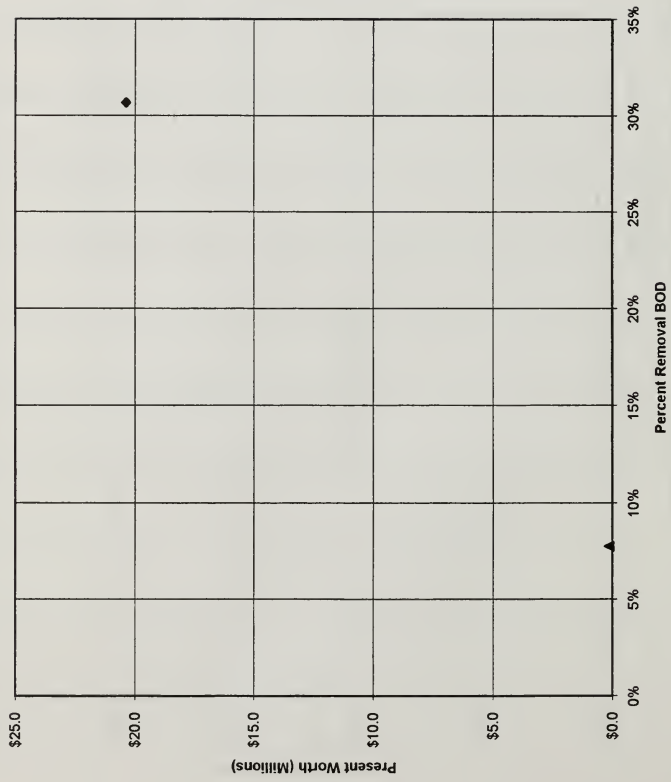
◆ Sewer Sep @ SOM007 & CSO Rebo. @ SOM007A
▲ Sewer Sep at SOM007 Cont. Treat. @ Som. Marg 007A

Upper Mystic Total Load Reductions as a Percent of Baseline Total Load (1-Year Storm)



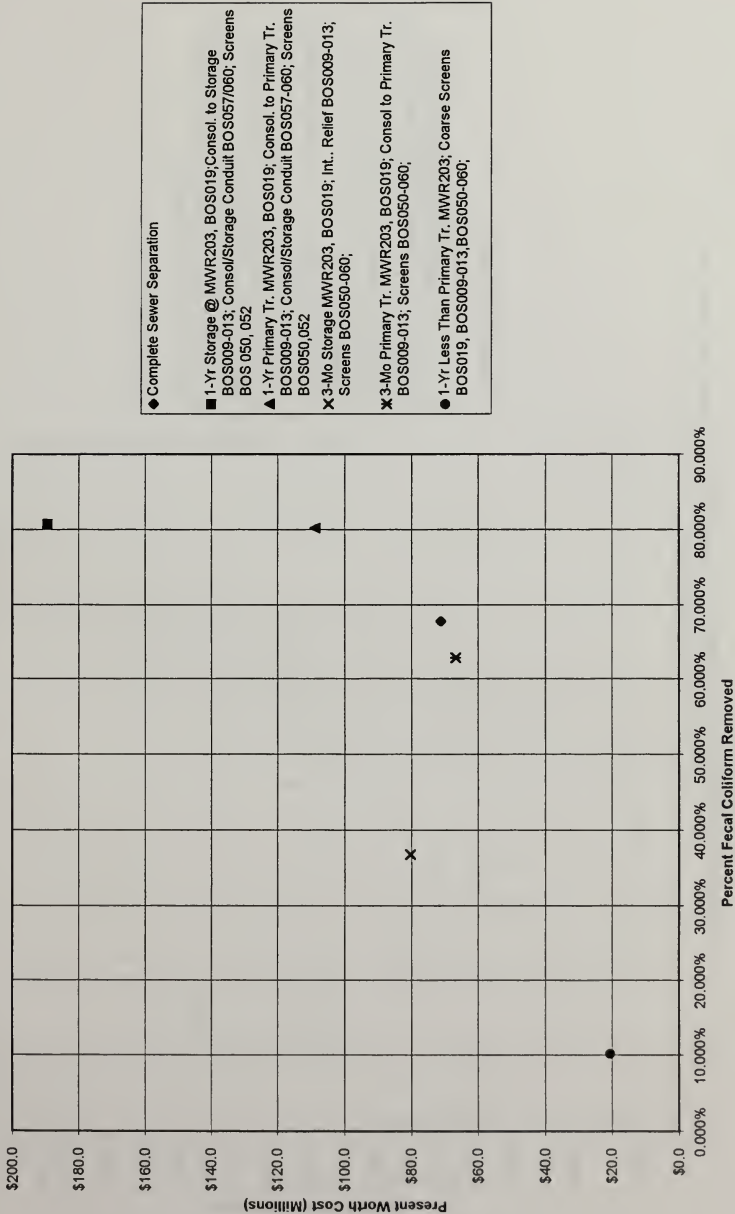
◆ Sewer Sep @SOM007 & CSO Reloc. @SOM007A
▲ Sewer Sep at SOM007 Cont. Treat. @ Som. Marg 007A

Upper Mystic Total Load Reductions as a Percent of Baseline Total Load
(1-Year Storm)

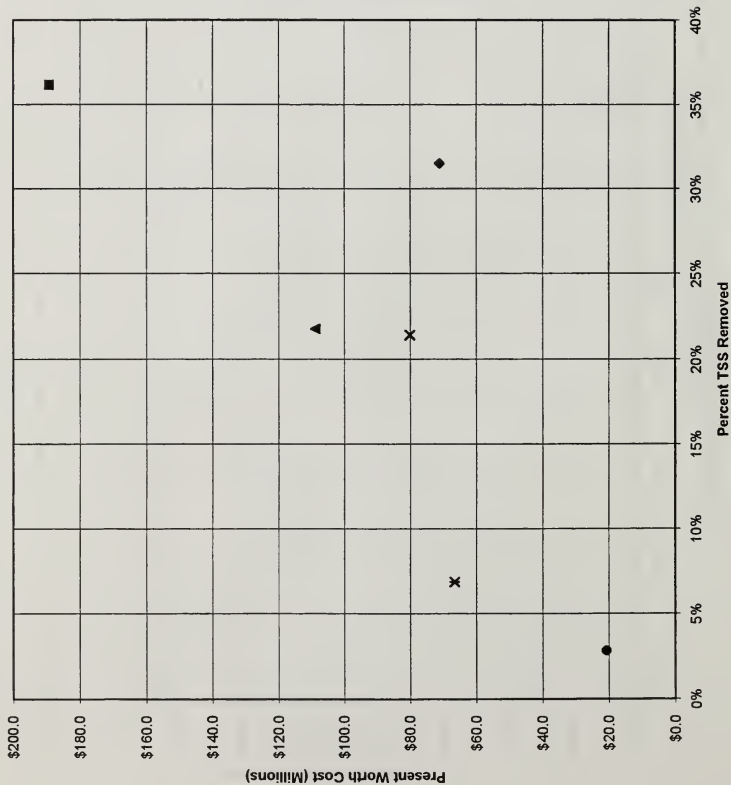


◆ Sewer Sep @SOM007 & CSO Reloc. @SOM007A
▲ Sewer Sep at SOM007 Cont. Treat. @ Som. Marg 007A

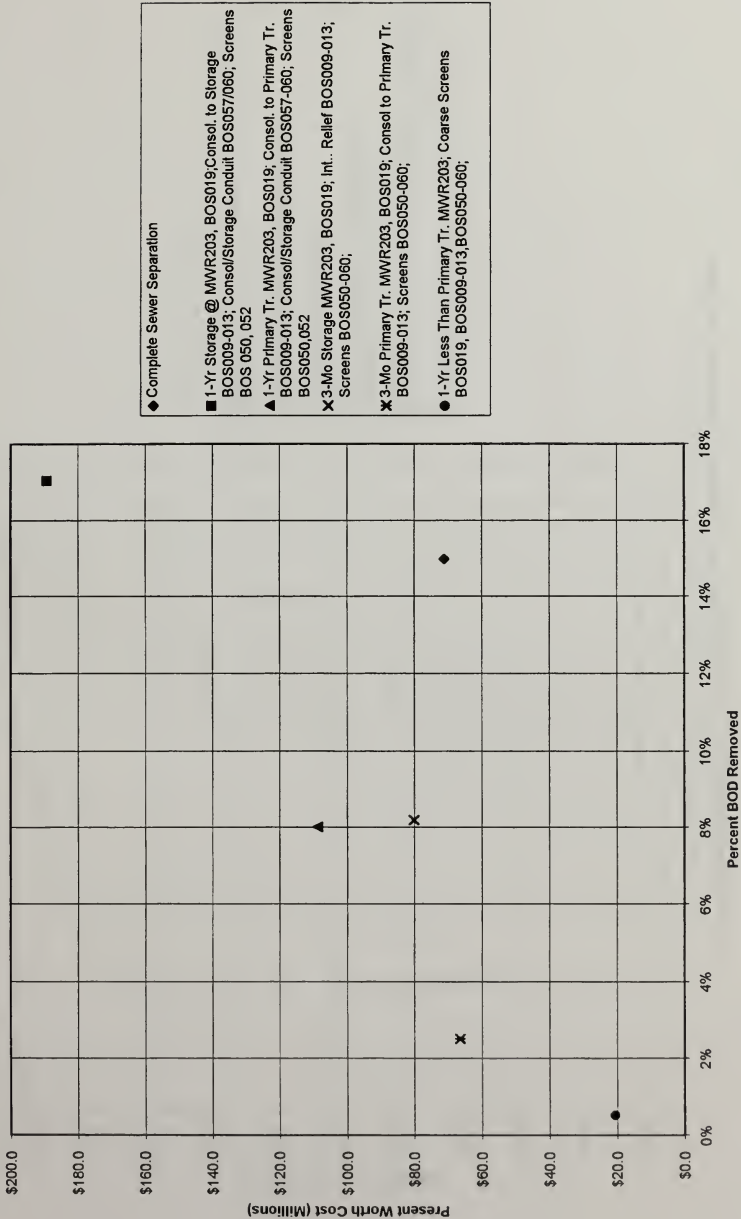
Upper Inner Harbor Total Load Reductions as a Percent of Baseline Total Load
(1-Year Storm)



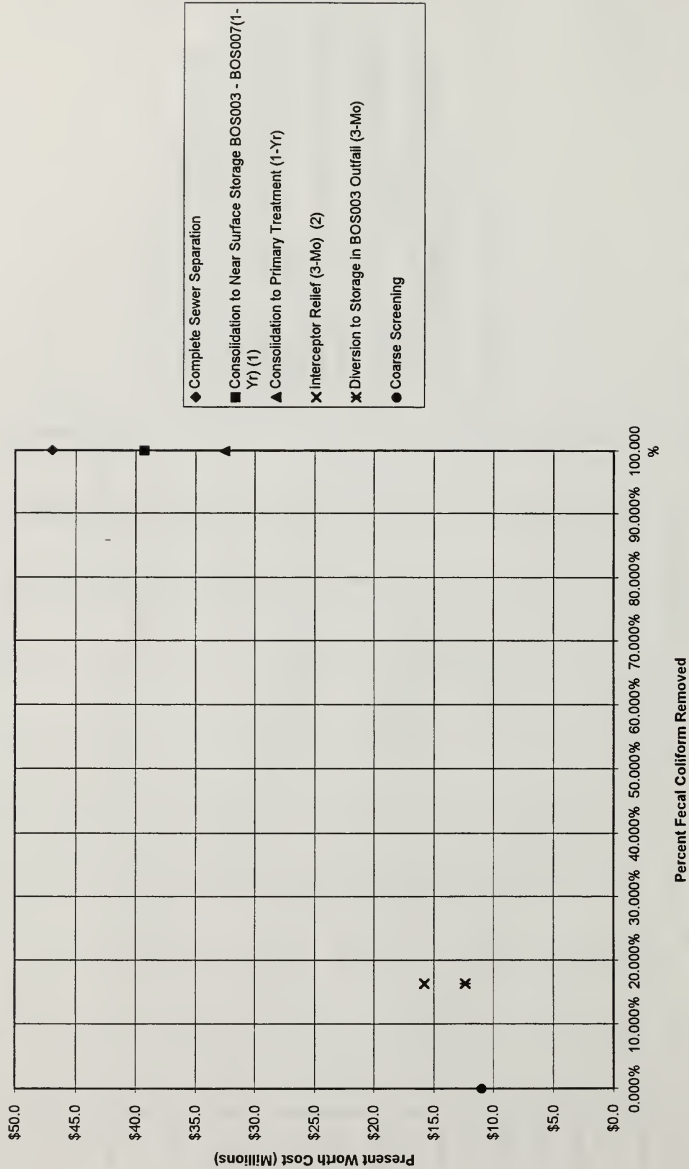
Upper Inner Harbor Total Load Reductions as a Percent of Baseline Total Load
(1-Year Storm)



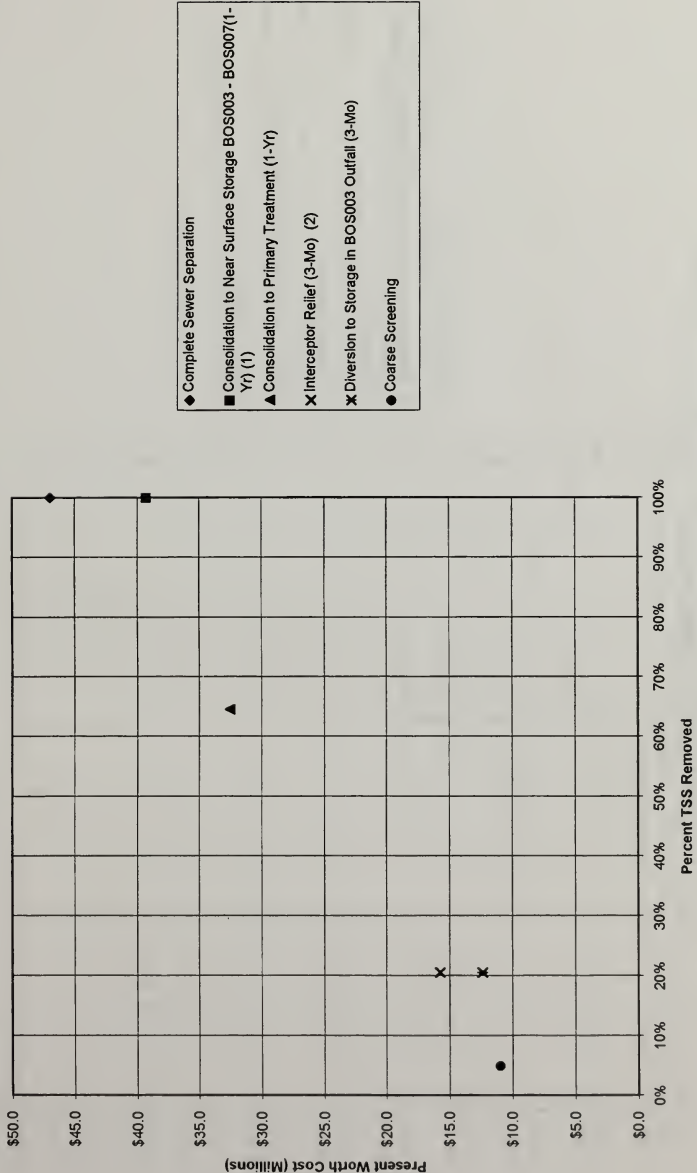
Upper Inner Harbor Total Load Reductions as a Percent of Baseline Total Load
(1-Year Storm)



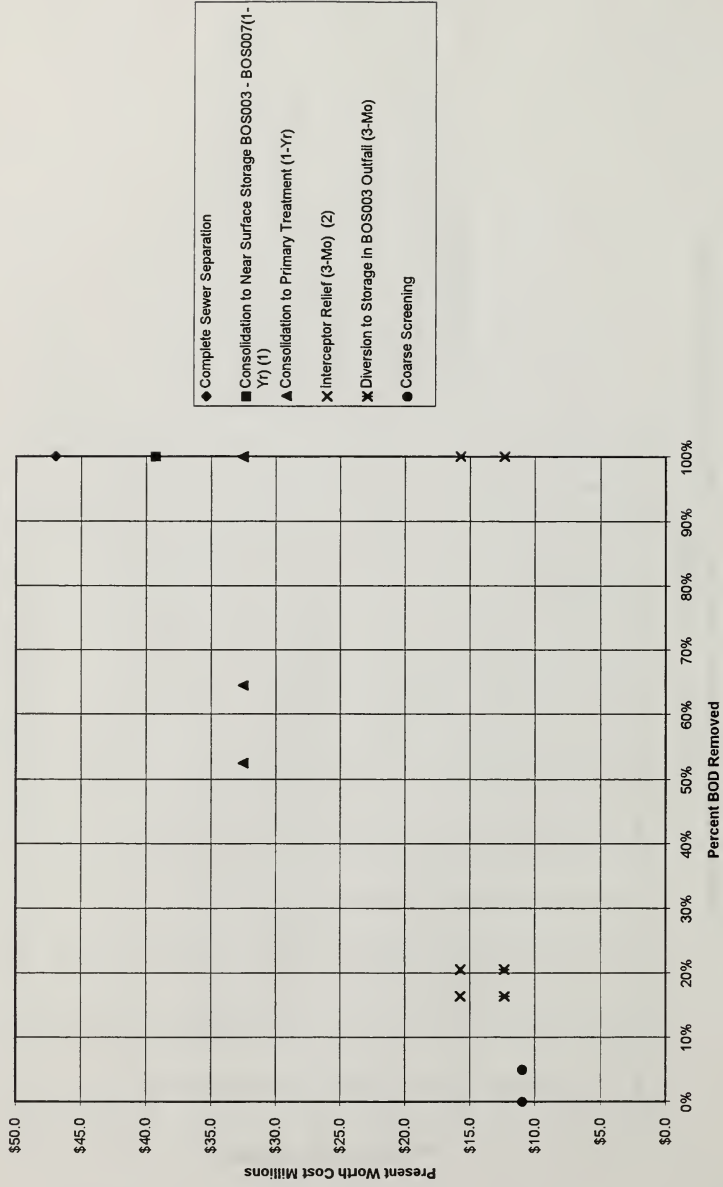
Lower Inner Harbor CSO Load Reductions as a Percent of Baseline CSO Load
(1-Year Storm)



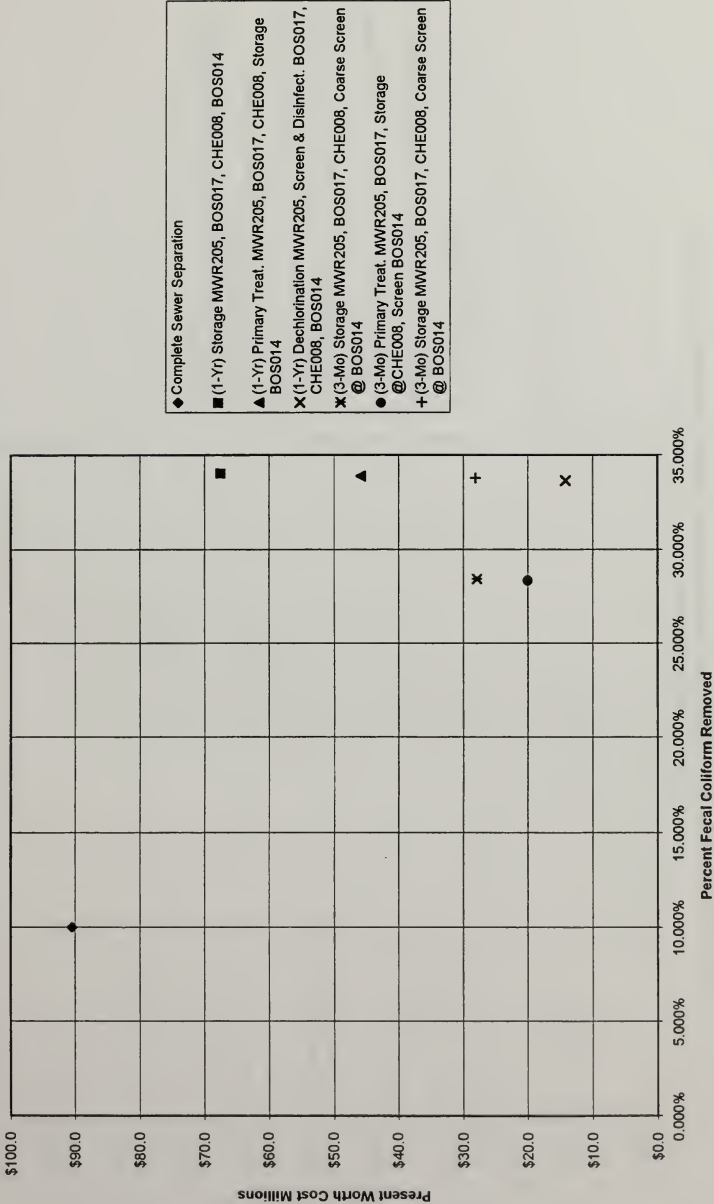
Lower Inner Harbor CSO Load Reductions as a Percent of Baseline CSO Load
(1-Year Storm)



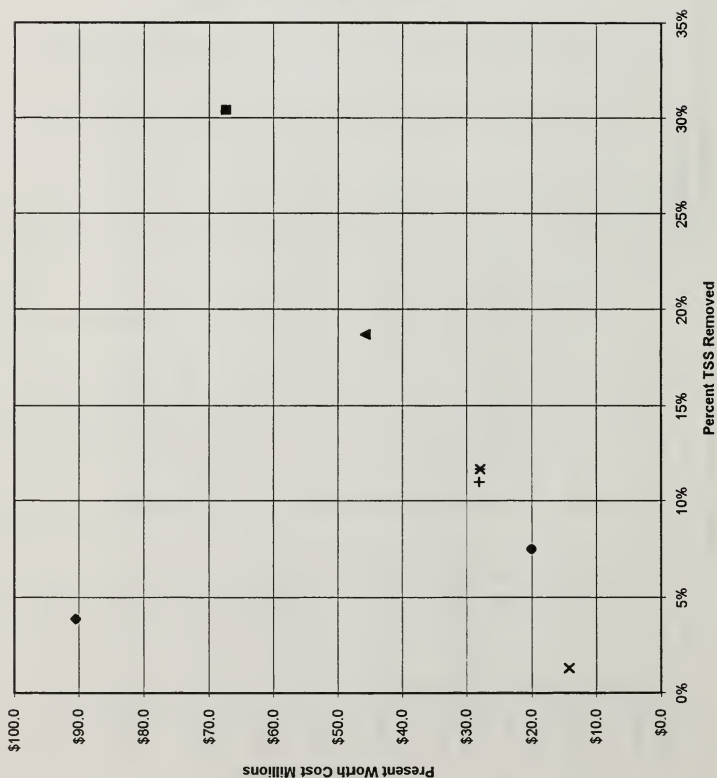
Lower Inner Harbor CSO Load Reductions as a Percent of Baseline CSO Load
(1-Year Storm)



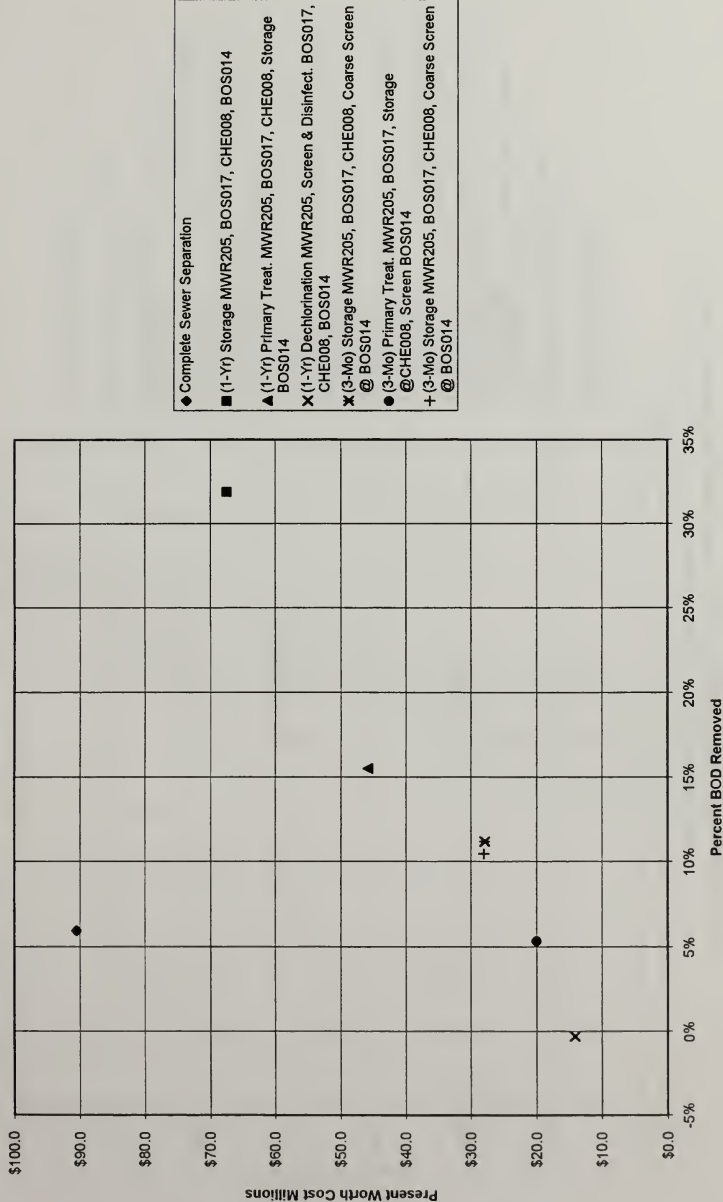
Mystic Chelsea Confluence Total Load Reductions as a Percent of Baseline Total Load
(1-Year Storm)



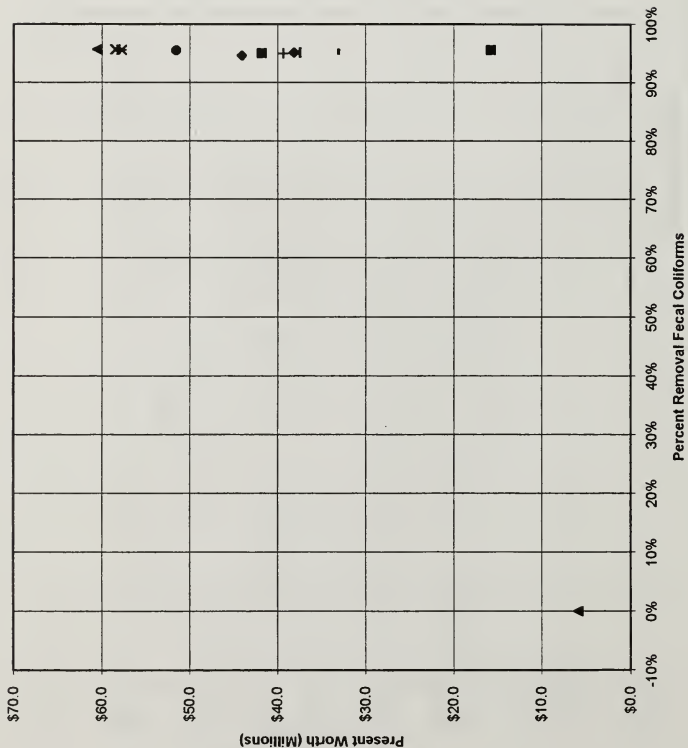
Mystic Chelsea Confluence Total Load Reductions as a Percent of Baseline Total Load
(1-Year Storm)



Mystic Chelsea Confluence Total Load Reductions as a Percent of Baseline Total Load
(1-Year Storm)

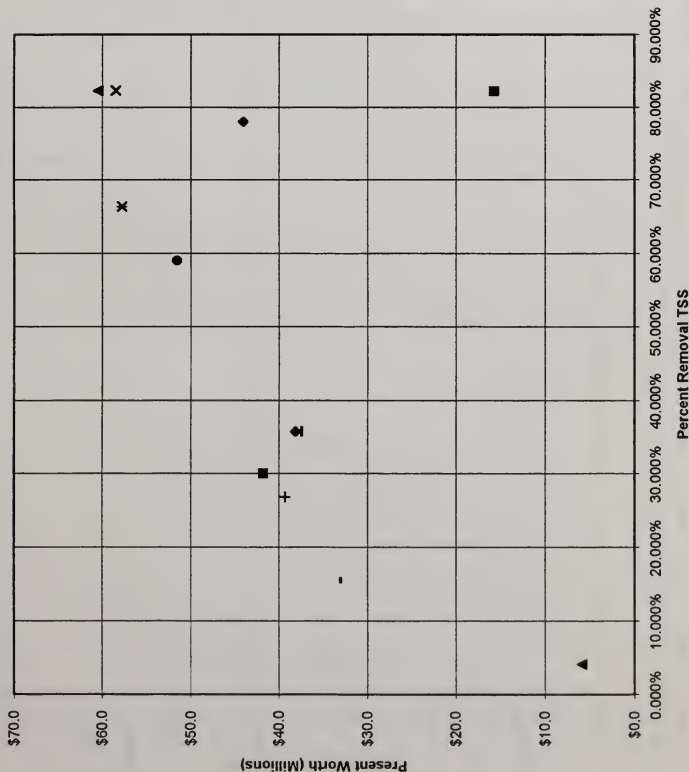


Reserved Channel Total Load Reductions as a Percent of Baseline Total Load (1-Year Storm)

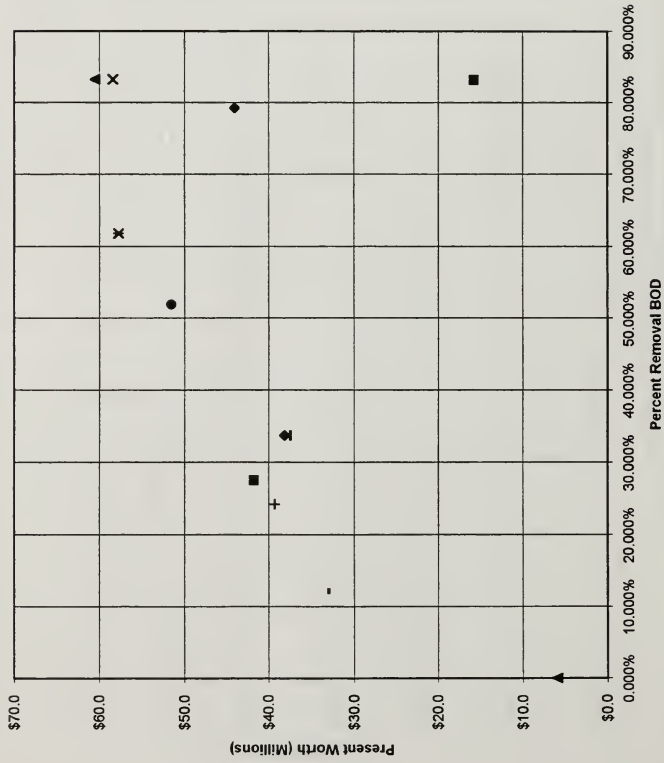


- ◆ Complete Sewer Separation
- CSO Relocation to Fort Point Channel
- ▲ Consolidated Near Surface Storage Facility BOS076 to BOS080 (1-Yr)
- ✕ Consolidated Near Surface Storage Facility BOS080 to BOS076 (1-Yr)
- ✕ Consolidated Near Surface Primary Treat. Facility BOS076 to BOS080 (1-Yr)
- Consolidated Near Surface Primary Treat. Facility BOS080 to BOS076 (1-Yr)
- + Consolidation Screen and Disinfection Facility BOS076 to BOS080 (1-Yr)
- Consolidation Screen and Disinfection Facility BOS080 to BOS076 (1-Yr)
- Consolidated Near Surface Storage Facility BOS076 to BOS080 (3-Mo)
- ◆ Consolidated Near Surface Storage Facility BOS080 to BOS076 (3-Mo)
- Consolidated Near Surface Primary Treat. Facility BOS080 to BOS076 (3-Mo)
- ▲ Coarse Screens @ Outfalls

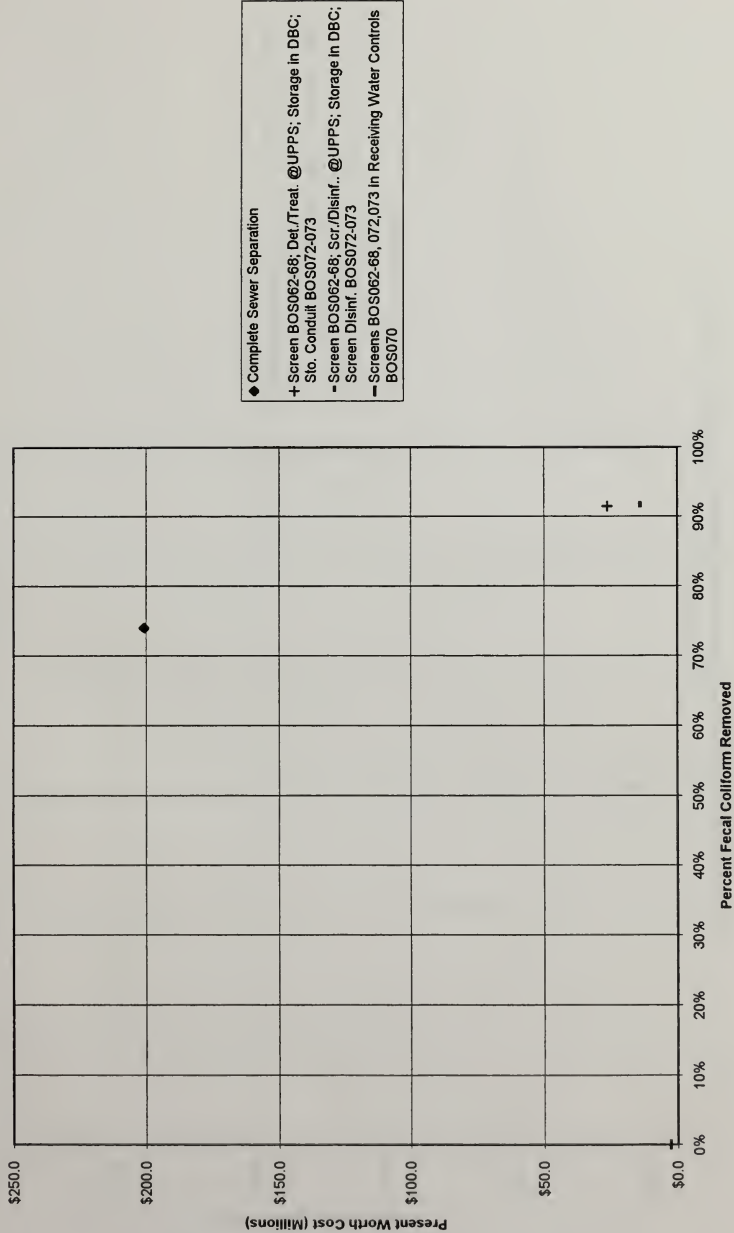
Reserved Channel Total Load Reductions as a Percent of Baseline Total Load
(1-Year Storm)



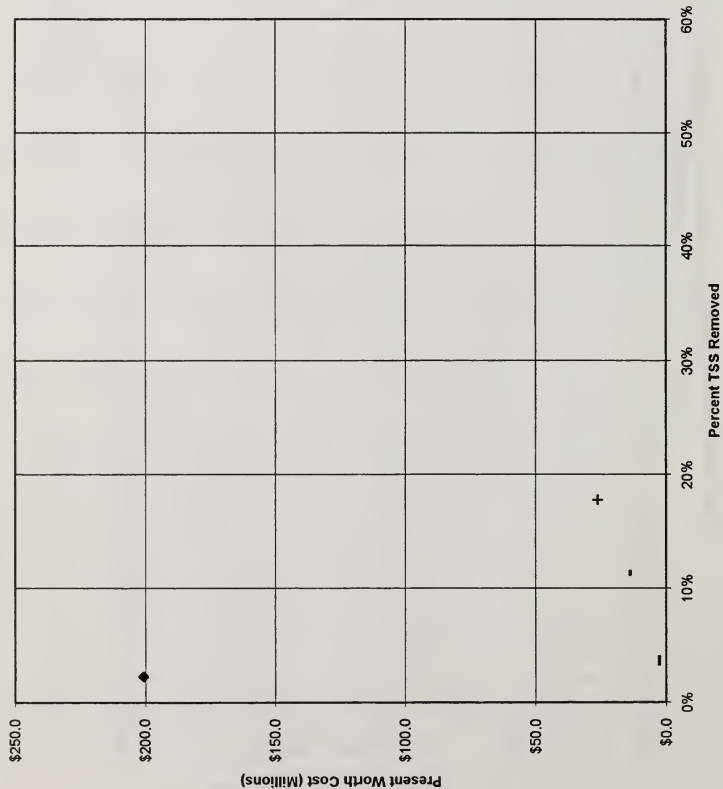
Reserved Channel Total Load Reductions as a Percent of Baseline Total Load (1-Year Storm)



Fort Point Channel Total Load Reductions as a Percent of Baseline Total Load
(1-Year Storm)



Fort Point Channel Total Load Reductions as a Percent of Baseline Total Load
(1-Year Storm)



Present Worth Cost (Millions)

Percent TSS Removed

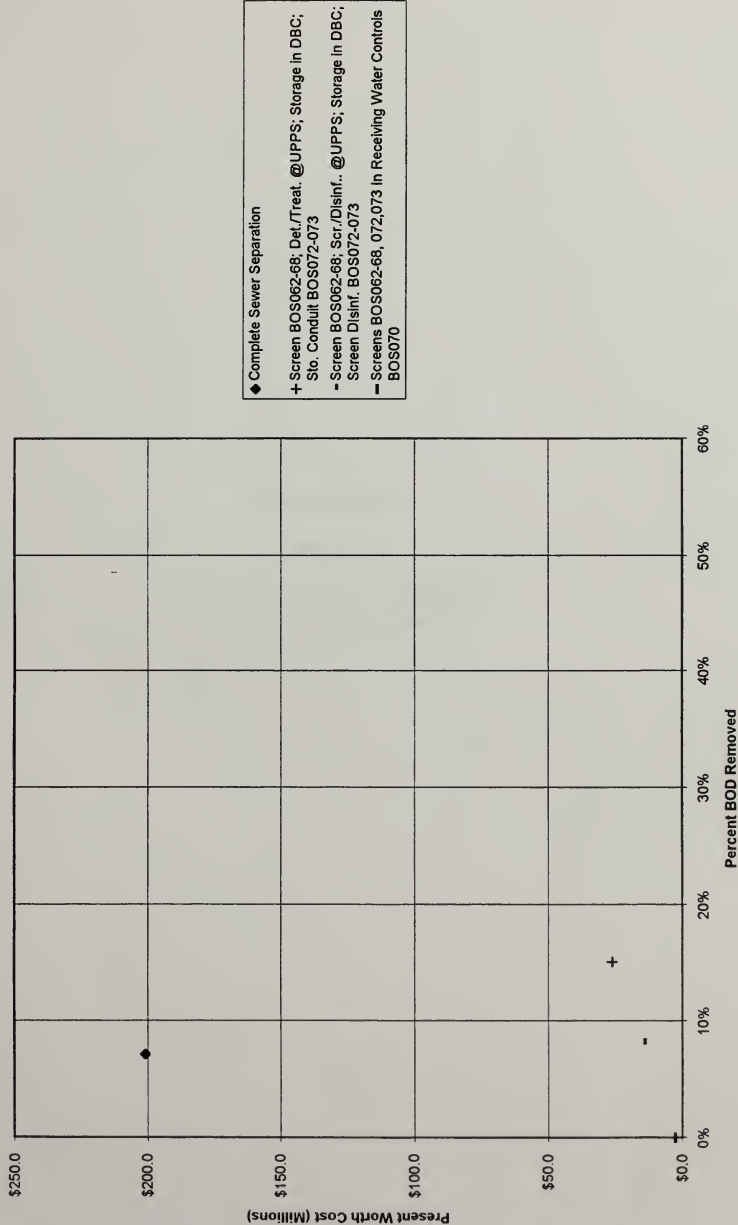
◆ Complete Sewer Separation

+ Screen BOS062-68; Det./Treat @UPPS; Storage in DBC; Slo. Conduit BOS072-073

+Screen BOS062-68; Scr./Disinf., @UPPS; Storage in DBC; Screen Disinf. BOS072-073

— Screens BOS062-68, 072, 073 In Receiving Water Controls BOS070

Fort Point Channel Total Load Reductions as a Percent of Baseline Total Load
(1-Year Storm)



VOLUME TWO
APPENDIX C
WATER QUALITY IMPACTS
OF CSO ALTERNATIVES

WATER QUALITY IMPACTS OF CSO ALTERNATIVES IN NORTH DORCHESTER BAY

Use	Use Attainment	Parameter	Measures	Future Planned Conditions	NDB1	CSO Relocation to Reserved Channel	Consolidation/ Storage Conduit (1 Yr)	NDB3
Shellfishing	0	bacteria*	hours > 14*** ⁽ⁱ⁾ after 1 yr storm	54.9	(2)	45.5	(2)	44.5
			hours > 88 ⁽ⁱ⁾ after 1 yr storm	29.0	(2)	20.7	(1)	17.6
		CSO proximity**	# outfalls within closure zone active in 1 yr storm	6	(1)	0	(1)	0
Swimming	0	bacteria	total 1 yr storm load (CSO+SW)	6.47 E13	3.60 E13	1.99 E13	1.99 E13	1
			hours > 200 ⁽ⁱ⁾ after 1 yr storm	20.7	(1)	8.3	(1)	3.1
Boating	+	bacteria	hours > 1000 ⁽ⁱ⁾ after 1 yr storm	5.2	(1)	0	(1)	0
Aquatic life	0	sediment	CSO + SW load TSS (lbs) after 1 yr storm	8,010	(3)	9,830	(1)	5,440
			after 3 mo storm	3,890	(3)	6,260	(2)	3,481
			Level of Control		I		II	
Alternative Performance				78	0	0	1 - 3	
			Closure of CSOs	0	8	7	1 - 7	
			Treat stormwater	N	N	N	N	
Alternative Summary Rating					7	5	5	
Alternative Ranking					2	1	1	

*The duration of simulation period was 99.4 hours.
 ** DMF has a formula that calculates closure distance as fcn. of CSO flow, vol. of receiving water segment, and bacteria load (assuming total chlorination failure); number of outfalls indicated are within closure zone for unrestricted shellfishing.
 ***OPEN shellfishing requires geom. mean fecal coliform counts below 14/100 ml
 To avoid toxicity, all chlorinated CSO discharges are assumed to be dechlorinated as well
 Reserved Channel currently has pretty good water quality in spite of a large CSO load, to which relocation would add only a little
 No aesthetics parameters because currently no CSO-associated aesthetic problem observed in N. Dorchester Bay
⁽ⁱ⁾ Modal data at Carson Beach
 0 Indicates non-attainment of use during wet weather
 + Indicates use is attained

WATER QUALITY IMPACTS OF CSO ALTERNATIVES IN NORTH DORCHESTER BAY

Use	Use Attainment	Parameter	Measures	NDB4 Interceptor Relief: System Optimization 081,082 (1 Yr)	NDB5 Consolidation/Storage Conduit (3 Mo)
Shellfishing	0	bacteria**	hours > 14*** (i) after 1 yr storm	(2) 44.5	(2)
			hours > 88 (i) after 1 yr storm	(1) 17.6	(2)
		CSO proximity**	# outfalls within closure zone	(1) 0	(2)
Swimming	0	bacteria	total 1 yr storm load (CSO+SW)	1.99 E13 (1)	4.31 E13 (1)
			hours > 200 (i) after 1 yr storm	(1) 3.1	(2)
Boating	+	bacteria	hours > 1000 (i) after 1 yr storm	(1) 0	(2)
Aquatic life	0	sediment	CSO+SW load TSS (lbs) after 1 yr storm	(1) 5,440	(2) 6,710
			after 3 mo storm	3,481 (2)	3,481 (2)
Alternative Performance			Level of Control	II	II
			# of untreated overflows/yr		
			Closure of CSOs	0	1 - 7
			Treat stormwater		
				N	N
Alternative Summary Rating				5	7
Alternative Ranking				1	2

*The duration of simulation period was 99.4 hours.
 ** DWF has a formula that calculates closure distance as fcn. of CSO flow, vol. of receiving water segment, and bacteria load (assuming total chlorination failure):
 number of outfalls indicated are within closure zone for unrestricted shellfishing.
 *** OPEN shellfishing requires geom. mean fecal coliform counts below 14/100 ml
 To avoid toxicity, all chlorinated CSO discharges are assumed to be dechlorinated as well
 Reserved Channel currently has pretty good water quality in spite of a large CSO load, to which relocation would add only a little
 No aesthetics parameters because currently no CSO-associated aesthetic problem observed in N. Dorchester Bay
 (i) Model data at Carson Beach
 0 Indicates non-attainment of use during wet weather
 + Indicates use is attained

WATER QUALITY IMPACTS OF CSO ALTERNATIVES FOR SOUTH DORCHESTER BAY

Use	Use Attainment	Parameter	Measures	Future Planned Conditions	SDB1 Sewer Separation	SDB2 Indiv. Storage Tanks at BOS090, BOS088/089 (1 yr)	SDB3 Consolidated Storage Facility at Fox Point (1 yr)
Shellfishing	-	Bacteria*	Measures hours > 88 after 1 yr storm	MB: 45.6 TB: 46.6	(2) MB: 44.5 TB: 44.5	(1)	(1)
		CSO proximity**	# outfalls within closure zone active in 1 yr storm	2	(1) 0	(1) 0	(1) 0
Swimming	-	bacteria	total 1 yr storm load (lbs) (CSO + stormwater) hours > 200 after 1 yr storm	1,46 E13	3,64 E13 (3) MB: 33.1 TB: 34.1	1,34 E13 (2) (1)	1,34 E13 (2) (1)
Boating	0	bacteria	hours > 1000 after 1 yr storm	MB: 15.5 TB: 16.6	MB: 8.3 TB: 15.5	1	1
Aesthetics	0	slicks (solids, oil, scum)	vol. of "untreated" overflows*** after 1 yr storm (MG) after 3 mo storm (MG)	0 0	(1) 0	(1) 0	(1) 0
			CSO TSS load (plumes) (lbs) after 1 yr storm after 3 mo storm	23,100 8,370	(1) 0 0	(1) 0 1	(1) 0 1
		odor	vol. of CSO (MG) after 1 yr storm after 3 mo storm	19,76 7,17	(1) 0	(1) 0	(1) 0
Aquatic life	0	sediment	CSO + SW load TSS (lbs) after 1 yr storm after 3 mo storm	26,700 11,300	(1) 9,900 6,880	(1) 3,600 2,930	(1) 3,600 2,930
		Level of Control			I (1)	II (1)	II (1)
Alternative Performance		# of untreated overflows/yr		0	0	0	0
		Closure of CSOs		0	3	1	1 - 2
		Treat stormwater ****		Y	Y	Y	Y
Alternative Summary Rating					7	6	6
Alternative Ranking					2	1	1

*The duration of simulation period was 99.4 hours.
Sample locations at Melbou Beech (MB) and Tenen Beech (TB).
** DMF has a formula that calculates closure distance as fcn. of CSO flow, vol. of receiving water segment, and bacteria load (assuming total chlorination failure); number of outfalls indicated are within closure zone for unrestricted shellfishing.
***"untreated" overflows defined as receiving coarse screening, only, or less.
****Stormwater is presently being treated at the existing Fox Point and Commercial Point.
- Indicates non-attainment of use during wet and dry weather
0 Indicates non-attainment of use during wet weather

WATER QUALITY IMPACTS OF CSO ALTERNATIVES FOR SOUTH DORCHESTER BAY

Use	Use Attainment	Parameter	Measures	SDB4 Indiv. Primary Treat at BOS090 BOS088/089 (1 yr)	SDB5 Upgrade Existing Facilities for Dachlorination (1 Yr)	SDB6 Indiv. Storage Tanks at BOS090, BOS088/089 (3 mo)	SDB7 Consolidated Storage Facility at Fox Point (3 mo)	SDB8 Indiv. Primary Treat at BOS090 BOS088/089 (3 mo)
Shellfishing	-	bacteria *	hours > 88 after 1 yr storm	MB: 43.5 TB: 44.5 (2)	(2)	(1)	(1)	(1)
		CSO proximity**	# outfalls within closure zone active in 1 yr storm	(2)	(2)	(2)	(2)	(2)
Swimming	-	bacteria	total 1 yr storm load (lbs) (CSO + stormwater) hours > 200 after 1 yr storm	1.39 E13 (2) MB: 33.1 TB: 34.1 (2)	1.46 E13 (2) (1)	1.42 E13 (2)	1.42 E13 (1)	1.43 E13 (2)
Boating	0	bacteria	hours > 1000 after 1 yr storm	MB: 7.2 TB: 15.5 (2)	1	(1)	(1)	1
Aesthetics	0	slicks (solids, oil, scum)	vol. of "untreated" overflows *** after 1 yr storm (MG) after 3 mo storm (MG)	(1) 0 (1)	(1) 0 (1)	(1) 0 (1)	(1) 0 (1)	(1) 0 (1)
		CSO TSS load (plumes) (lbs) after 1 yr storm after 3 mo storm	890 (1)	9.710 (1)	21,900 (2)	14,400 (1)	14,400 (1)	16,300 (2)
		odor	vol. of CSO (MG) after 1 yr storm after 3 mo storm	(1) 13.86 1.27 (2)	(2) (2)	(1) (1)	(1) (1)	(1) (1)
Aquatic life	0	sadiment	CSO + SW load TSS (lbs) after 1 yr storm after 3 mo storm	(1) 13,300 3820 (1)	(2) 25,550 10,881 (2)	(1) 17,590 2,930 (1)	(1) 17,590 2,930 (1)	(2) 19,950 5,290 (1)
Alternative Performance				II	II	II	II	II
# of untreated overflows/yaar				0	0	0	0	0
Closures of CSOs				0	0	0	0	0
Treat stormwater				Y	Y	Y	Y	Y
Alternative Summary Rating				8	9	6	6	7
Alternative Ranking				3	3	1	1	2

*The duration of simulation period was 99.4 hours.
 Sample locations at Malibu Beach (MB) and Taneau Beach (TB).
 ** DMF has a formula that calculates closure distance as fcn. of CSO flow, vol. of receiving water segment, and bacteria load (assuming total chlorination failure).
 number of outfalls indicated are within closure zone for unrestricted shellfishing.
 ***"untreated" overflows defined as receiving coarse screening, only, or less.
 ****"Stormwater is presently being treated at the existing Fox Point and Commercial Point.
 - Indicates non-attainment of use during wet and dry weather
 0 Indicates non-attainment of use during wet weather

WATER QUALITY IMPACTS OF CSO ALTERNATIVES FOR NEPONSET RIVER

Use	Use Attainment	Parameter	Measures	Futura Planned Conditions	N1	N2	N3
Shellfishing	-	bacteria*	hours > 88*** after 1 yr storm	46.6	46.6	2	1
		CSO proximity**	# outfalls w/in closure zone	2	0	0	1
Swimming	0	bacteria	total 1 yr storm load (CSO + SW) hours > 200	6.85 E13	1.30 E13	1.21 E13	1.22 E13
			after 1 yr storm	38.3	34.1	34.1	(1)
Boating	-	bacteria	hours > 1000	16.6	15.5	16.6	1
			after 1 yr storm		(2)	(2)	(1)
Asesthetics	-	slids (solids, oil, scum)	vol. of overflows*** (MG) after 3 mo storm	0.33	(1)	(1)	(1)
			after 1 yr storm	2.77	0	0	1.88
			CSO TSS load (plumas) (lbs) after 3 mo storm	385	(1)	(1)	(1)
			after 1 yr storm	3,230	0	0	0
					(1)	(1)	1,320
Alternative Performance				Level of Control	1	1, 1 yr.	1, 1 yr.
				# of untreated overflows/yr	(1)	(2)	(2)
				Closure of CSOs	0	1-3	1-3 (BOS093)
				Trast stormwater	2	2	2
Alternative Summary Rating				N	N	N	N
				8	(2)	9	(2)
Alternative Ranking				2	2	2	1

*The duration of simulation period was 99.4 hours.
 **DMF has a formula that calculates closure distance as fcn. of CSO flow, vol. of receiving water segment, and bacteria load (assuming total chlorination failure); number of outfalls indicated are within closure zone for unrestricted shellfishing.
 ***"untreated" overflows means overflow events where solids, scum, oil, and small and large floatables are not controlled in the overflow; assumed to be locations which receive coarse screening only.
 No aquatic life CSO issues in this segment, provided there are no chlorinated discharges
 To avoid toxicity, all chlorinated CSO discharges are assumed to be dechlorinated as wall
 **Rec. water modeling of Neponset River estuary is unavailable so assume = effects at Taneen Beach
 - Indicates non-attainment of use during wet and dry weather.
 0 Indicates non-attainment of use during wet weather.

WATER QUALITY IMPACTS OF CSO ALTERNATIVES FOR NEPONSET RIVER

Use	Use Attainment	Parameter	Measures	N4 Consolidation Near Surface Primary Treat Near BOS093 (1 Yr)	N5 Indiv. Screen / Disinfect / Dechlor at BOS095, 095 (1 Yr)	N6 Indiv. Storage Tanks at BOS095, 095 (3 Mo)	N7 Coarse Screen at Outfalls
Shellfishing	-	bacteria*	Measures hours > 88***	1 (1)	2 (2)	2 (2)	2 (2)
		CSO proximity**	# outfalls w/in closure zone	2 (2)	2 (2)	2 (2)	2 (2)
Swimming	O	bacteria	total 1 yr storm load (CSO + SW)	1.21 E13 (1)	1.26 E13 (1)	1.26 E13 (1)	6.85 E13 (2)
			hours > 200	(2)	(1)	(1)	(2)
Boating	-	bacteria	hours > 1000 after 1 yr storm	2 (2)	1 (1)	1 (1)	2 (2)
Aesthetics	-	slicks (solids, oil, scum)	vol. of overflows*** (MG) after 3 mo storm after 1 yr storm	0 1.05 (1)	0.33 2.77 (2)	0 2.44 (1)	0.33 2.77 (2)
		CSO TSS load (plumes) (lbs) after 3 mo storm after 1 yr storm	0 736 (1)	1 (1)	366 3,070 (2)	0 2,710 (2)	366 3,070 (2)
Alternative Performance		Level of Control	II, 1 yr. (1)	II, 1 yr. (2)	II, 1 yr. (2)	II, 3 mo. (2)	III (3)
		# of untreated overflows/yr	0 (2)	0 (2)	0 (2)	0 (2)	17 (3)
		Closure of CSOs	0-1 (2)	1 (1)	2 (2)	2 (2)	0 (3)
		Treat stormwater	N (2)	N (2)	N (2)	N (2)	N (2)
Alternative Summary Rating			5 (2)	6 (2)	8 (2)	8 (2)	11 (3)
Alternative Ranking			2	2	2	2	3

*The duration of simulation period was 99.4 hours.

**DMF has a formula that calculates closure distance as fcn. of CSO flow, vol. of receiving water segment, and bacteria load (assuming total chlorination failure); number of outfalls indicated are within closure zone for unrestricted shellfishing.

***"untreated" overflows means overflow events where solids, scum, oil, and small and large floatables are not controlled in the overflow; assumed to be locations which receive coarse screening only.

No aquatic life CSO issues in this segment, provided there are no chlorinated discharges.

To avoid toxicity, all chlorinated CSO discharges are assumed to be dechlorinated as well.

**Rec. water modeling of Neponset River estuary is unavaliable so assume = effects at Taneen Beach

- Indicates non-attainment of use during wet and dry weather.

O Indicates non-attainment of use during wet weather.

WATER QUALITY IMPACTS OF CSO ALTERNATIVES FOR CONSTITUTION BEACH

Use	Use Attachment	Parameter	Measures	Future Planned Conditions	CB-1		CB-2		CB-3		CB-4	
					Complete Sewer Separation		Moore St. Interceptor Relief (1 year)		Near Surface Storage (1 year)		Near Surface Storage (3 month)	
Shellfishing	O	bacteria*	hours > 14 after 1 yr storm	BH2: 43.5 BHD: 60.0 BHC: 60.1	42.5 (2)	60.0 (2)	42.5 (2)	60.0 (2)	42.5 (2)	60.0 (2)	NA (2)	NA (2)
			hours > 88 after 1 yr storm	BH2: 5.2 BHD: 38.3 BHC: 38.4	5.2 (2)	38.3 (2)	5.2 (2)	38.3 (2)	5.2 (2)	38.3 (2)	NA (2)	NA (2)
			# outfalls within closure zone active in 1 yr storm	1	0 (1)	0 (1)	0 (1)	0 (1)	0 (1)	0 (1)	1 (2)	1 (2)
			1 yr CSO + SW load (lbs)	6.05E+15	6.28E+15 (2)	0.0 (2)	6.04E+15 (2)	0.0 (2)	6.04E+15 (2)	0.0 (2)	6.05E+15 (2)	6.05E+15 (2)
Swimming	O	bacteria	hours > 200 after 1 yr storm	BH2: 0.0 BHD: 26.9 BHC: 26.0	0.0 (2)	27.9 (2)	0.0 (2)	27.9 (2)	0.0 (2)	27.9 (2)	NA (2)	NA (2)
Boating	+	bacteria	hours > 1000 after 1 yr storm	BH2: 0.0 BHD: 0.0 BHC: 2.1	0.0 (1)	0.0 (1)	0.0 (1)	0.0 (1)	0.0 (1)	0.0 (1)	NA (2)	NA (2)
Alternative Performance			Level of Control		(1)	(1)	(2)	(2)	(2)	(2)	(2)	(2)
			# of untreated overflows/year***	16	(1) 0	(1) 0	(2) 1-3	(2) 1-3	(2) 1-3	(2) 1-3	(2) 4-8	(2) 4-8
			Closure of CSOs	0	(1) 1	(1) 1	(3) 2	(3) 2	(3) 2	(3) 2	(3) 2	(3) 2
			Treat stormwater	N	N*** 6	N*** 6	N 7	N 7	N 8	N 8	N 8	N 8
Alternative Summary Rating					1	1	2	2	2	2	3	3

*The duration of simulation was 99.4 hours.
 Sample locations along the east shore of Logan Airport (BH2), at Orient Heights Beach (BHD), and near outfall MWR 207 (BHC).
 **DMF formula ranking calculates closure distance as a function of CSO flow, volume of receiving water segment and bacteria load (assuming total chlorination failure); number of outfalls indicated are within closure zone for unrestricted shellfishing
 ***"untreated" overflows defined as receiving coarse screening only, or less.
 ****Potential to treat separated stormwater through existing Constitution Beach CSO Facility, would otherwise be abandoned

+ Indicates designated use is attained.
 O Indicates non-attainment of use during wet weather.

WATER QUALITY IMPACTS OF CSO ALTERNATIVES FOR UPPER CHARLES

Use	Use Attainment	Parameter	Measures	Future Planned Conditions	UC1	UC2	UC3
Boating	0	bacteria *	hours > 1000 after 1-yr storm	72.4	(2) 72.4	(2) 72.4	(2) 73.5
Swimming (sailboarding)	-	bacteria *	Tot. 1-yr Storm Load (lbs) hours > 200 after 1-yr storm	2.75 E16 99.3	(3) 3.17 E16 99.3	(3) 2.91 E16 99.4	(2) 2.41 E16 99.4
Aesthetics	-	slicks (solids, oil, scum) small floatables	Volume of "untreated" overflows ** after 3 mo. storm (MG) after 1-yr. storm (MG)	0.02 1.57	(1) 0	(1) 0	(1) 0
Aquatic Life	-	nutrients	CSO + SW load P (lbs) after 3 mo. storm after 1 yr. storm	470 796	(3) 605 990	(3) 554 908	(2) 469 753
		sediment	Boundary + CSO + SW load TSS (lbs) after 3 mo. storm after 1 yr. storm	59,400 89,400	(3) 71,200 108,200	(3) 66,760 101,000	(2) 59,423 87,450
Alternative Performance				Level of Control	1 (1)	II, 1 yr. (2)	II, 1 yr. (2)
				# of untreated overflows/year	0 (1)	1-3 (2)	1-3 (2)
				Closure of CSOs	6 (2)	0-3 (2)	0 (3)
				Treat stormwater	NO (2)	NO (2)	NO (2)
Alternative Summary Rating					10	11	9
Alternative Ranking					2	3	1

*The duration of simulation period was 99.4 hours.

Sample location at Weld boathouse.

**"untreated" overflows means overflow events where solids, scum, oil, and small and large floatables are not controlled in the overflow.

***Cottage Farm CSO has been observed to cause DO depression after storm

Cottage Farm currently has visible boil because of its large size relative to river flow & depth

To avoid toxicity, all chlorinated CSO discharges are assumed to be dechlorinated as well

Cottage Farm and Stony Brook are poorly mixed because of their large size relative to river flow

- Indicates non-attainment of use during wet end dry weather.

0 Indicates non-attainment of use during wet weather.

WATER QUALITY IMPACTS OF CSO ALTERNATIVES FOR UPPER CHARLES

Use	Use Attainment	Parameter	Measure	UC4 Screen/Disin at Cam005.009, BOS032	UC5 Screening at CAM005, 009, BOS032
Boating	0	bacteria*	hours >1000 after 1-yr storm	(2) 72.4	(2) 72.4
Swimming (sailboarding)	-	bacteria*	Tot. 1-yr Storm Load (lbs) hours > 200 after 1-yr storm	(2) 2.75 E16 99.3	(2) 2.75 E16 99.3
Aesthetics	-	slicks (solids, oil, scum) small floatables	Volume of "untreated" overflows ** after 3-mo. storm (MG) after 1-yr. storm (MG)	(1) 0 0 (1)	(2) 0.02 1.67 (2)
Aquatic Life	-	nutrients sediment	CSO + SW load P (lbs) after 3 mo. storm after 1 yr. storm Boundary + CSO + SW load TSS (lbs) after 3 mo. storm after 1 yr. storm	(2) 470 796 (2) 59,400 89,400 (2)	(2) 470 796 (2) 59,400 89,400 (2)
Alternative Performance					
Alternative Summary Rating			Level of Control	II, 1 yr. (2)	III (3)
			# of untreated overflows/year	0 (1)	12 (3)
			Closure of CSOs	0 (3)	0 (3)
			Treat stormwater	NO (2)	NO (1)
Alternative Ranking				9 1	11 3

*The duration of simulation period was 99.4 hours.
 Sample location at Weld boathouse.
 **"untreated" overflows means overflow events where solids, scum, oil, and small and large floatables are not controlled in the overflow.
 ***Cottage Farm CSO has been observed to cause DO depression after storm
 Cottage Farm currently has visible boil because of its large size relative to river flow & depth
 To avoid toxicity, all chlorinated CSO discharges are assumed to be dechlorinated as well
 Cottage Farm and Stony Brook are poorly mixed because of their large size relative to river flow
 - Indicates non-attainment of use during wet and dry weather.
 0 Indicates non-attainment of use during wet weather.

WATER QUALITY IMPACTS OF CSO ALTERNATIVES FOR LOWER CHARLES

Use	Use Attainment	Parameter	Measure	LC1	LC2	LC3	LC4	LC5	LC6
Swimming (nonswimming)	-	bacteria *	Future Planned Conditions 6.12 E14 (CSO SW load (lbs) (CSO SW load (lbs) after 1 yr storm after 3 mo storm	Sewer Separation 2,865 E14 (1) (2)	Stony Brook cons. to storage; Cottage Farm storage, 1-yr 1.81 E14 (1) (2)	Stony Brook cons. to storage w/dwfr. Farm storage, 3-mo 1.37 E14 (1) (2)	Stony Brook cons. to aeration; Cottage Farm storage, 3-mo 1.89 E14 (1) (2)	Stony Brook aeration; Cottage Farm storage, 3-mo 1.36 E14 (1) (2)	Stony Brook Conduit Swirl, full flow pump to H.S. C.F. detention/drainage 1.36 E14 (1) (2)
Boating	0	bacteria *	99.3 hours > 1000 after 1 yr storm after 3 mo storm	99.3 (1) (2)	99.3 (1) (2)	99.3 (1) (2)	99.3 (1) (2)	99.3 (1) (2)	99.3 (1) (2)
Aesthetics	-	slits (solid, oil, silt)	vol. of CSO 45.06 after 1 yr storm 13.33 after 3 mo storm	61.1 (1) (2)	40.4 (1) (2)	32.78 (1) (2)	41.76 (1) (2)	46.08 (1) (2)	43.1 (1) (2)
	-	CSO TSS load (lb/acre)	53,780 after 1 yr storm 16,564 after 3 mo storm	0 (1) (2)	0 (1) (2)	36,300 (1) (2)	46,300 (1) (2)	51,100 (1) (2)	47,800 (1) (2)
	-	algae blooms	total load P (SW+CSO) (lbs) 1592 after 1 yr storm 732 after 3 mo storm	0 (1) (2)	0 (1) (2)	0 (1) (2)	0 (1) (2)	0 (1) (2)	0 (1) (2)
Acoustic life	-	DO-BOD	total load BOD (lbs) 133,000 after 1 yr storm 94,400 after 3 mo storm	118,000 (1) (2)	103,000 (1) (2)	124,350 (1) (2)	130,200 (1) (2)	133,000 (1) (2)	131,070 (1) (2)
	-	CSO BOD *** (lbs)	30,000 after 1 yr storm 8,670 after 3 mo storm	0 (1) (2)	0 (1) (2)	21,300 (1) (2)	27,200 (1) (2)	30,700 (1) (2)	29,200 (1) (2)
	-	nutrients	CSO+SW load P (lbs) 1,592 after 1 yr storm 602 after 3 mo storm	732 (1) (2)	388 (1) (2)	1,242 (1) (2)	1,481 (1) (2)	1,592 (1) (2)	1,433 (1) (2)
	-	sediment	CSO+SW load TSS (lbs) 140,000 after 1 yr storm 83,640 after 3 mo storm	115,100 (1) (2)	86,200 (1) (2)	122,600 (1) (2)	132,540 (1) (2)	137,310 (1) (2)	132,300 (1) (2)
	-	Level of Control	# of untreated overflow/yr **	1 (1)	1 (1)	2 (1)	2 (1)	2 (1)	2 (1)
Alternative Performance	-	Closure of CSOs	9 (1)	9 (1)	2 (1)	2 (1)	2 (1)	2 (1)	2 (1)
	-	Treat stormwater	NO (1)	NO (1)	NO (1)	NO (1)	NO (1)	YES (1)	YES (1)
Alternative Summary Rating	-		8 (1)	7 (1)	8 (1)	8 (1)	10 (1)	10 (1)	10 (1)
Alternative Ranking	-		2 (1)	1 (1)	2 (1)	2 (1)	3 (1)	3 (1)	3 (1)

**The duration of simulation period was 99.4 hours. Sample location at the Community Boating bathouses
***"untreated" overflow means overflow events where solids, silt, oil, and small and large floatables are not controlled in the overflow.

floatables are not controlled in the overflow.

***Cottage Farm CSO has been observed to cause DO depression after storm

Cottage Farm currently has visible boil because of its large size relative to river flow & depth

To avoid toxicity, all chlorinated CSO discharges are assumed to be dechlorinated as well

Cottage Farm and Stony Brook are poorly mixed because of their large size relative to river flow

0 indicates non-attainment of use during wet weather.

14 CSO BOS028, BOS049, CAM017 provide relief for the Prison Point CSO Facility,

and may not be closed as a result of separation of areas tributary to Stony Brook and Cottage Farm.

in CSOs BOS042 and MW010 can be closed based on SOP Report findings.

From 0 to 5 of outfalls MW016 to MW027 may be closed.

WATER QUALITY IMPACTS OF CSO ALTERNATIVES FOR ALEWIFE BROOK

Use	Use Attainment	Parameter	Measures	Future Planned Conditions	AB1	AB2	AB3	AB4
Boating	-	bacteria *	total 1 yr storm load	1.81 E14	1.2 E14 (1)	0.77 E14 (1)	0.77 E14 (1)	0.83 E14 (1)
Swimming	-		total 3 mo. storm load	6.73 E13	7.57 E13 (3)	4.9 E13 (1)	4.9 E13 (1)	5.29 E13 (2)
Aesthetics	-	small floatables (toilet paper)	vol. "untreated" overflows ** after 3 mo storm (MG) after 1 yr storm (MG)	0.9 5.1	0 0 (1)	0 0 (1)	0 0 (1)	0 0 (1)
Aquatic life	-	nutrients	CSO + SW load P (lbs) after 3 mo storm after 1 yr storm	177 372	238 374 (2)	154 242 (1)	154 242 (1)	185 324 (2)
		sediment	CSO + SW load TSS (lbs) after 3 mo storm after 1 yr storm	14,400 27,000	20,640 32,710 (3)	13,350 21,050 (2)	13,350 21,050 (2)	14,430 22,770 (2)
Alternative Performance				Level of Control	1 (1)	II, 1 Yr. (2)	II, 1 Yr. (2)	II, 1 Yr. (2)
				# of untreated overflows/year	0 (1)	1-3 (2)	1-3 (2)	1-3 (2)
				Closure of CSOs	11 (1)	0-9 (2)	0-9 (2)	0-9 (2)
				Treat stormwater	NO (2)	NO (2)	NO (2)	NO (2)
Alternative Summary Rating					9	7	7	8
Alternative Ranking					2	1	1	2

*The duration of simulation period was 99.4 hours.
 **"untreated" overflows means overflow events where solids, scum, oil, and small and large floatables are not controlled in the overflow.
 To avoid toxicity, all chlorinated CSO discharges are assumed to be dechlorinated as well
 - Indicates non-attainment of use during wet and dry weather.

WATER QUALITY IMPACTS OF CSO ALTERNATIVES FOR ALEWIFE BROOK

Use	Use Attainment	Parameter	Measures	AB5 Consolidation/Storage Conduit w/ Separation at CAM 004 (1 Yr)	AB6 Separation of CAM 004 (3-mo)	AB7 Consolidation/Storage Conduit (3 Mo)	AB8 Coarse Screening at Outfalls
Bathing	-	bacteria **	total 1 yr storm load	0.83 E14 (1)	1.38 E14 (2)	1.63 E14 (2)	1.81 E14 (2)
Swimming	-		total 3 mo. storm load	5.29 E13 (2)	5.30 E13 (2)	4.90 E13 (1)	6.73 E13 (2)
Aesthetics	-	small floatables (tollat paper)	vol. "untreated" overflows** after 3 mo storm (MG)	0 (1)	0 (1)	0 (1)	0.9 (2)
			after 1 yr storm (MG)	2.7 (1)	4.2 (1)	5.1 (2)	5.1 (2)
Aquatic life	-	nutrients	CSO + SW load P (lbs) after 3 mo storm	190 (2)	190 (2)	154 (2)	177 (2)
			after 1 yr storm	324 (2)	391 (2)	360 (2)	372 (2)
		sediment	CSO + SW load TSS (lbs) after 3 mo storm	14,430 (2)	14,444 (2)	13,350 (2)	14,400 (2)
			after 1 yr storm	22,770 (2)	25,760 (2)	25,700 (2)	27,000 (2)
Alternative Performance				Level of Control	II, 3 mo.	II, 3 mo.	III
				# of untreated overflows/year	1-3 (2)	4-7 (2)	16 (3)
				Closure of CSOs	0-9 (2)	0-9 (2)	0 (3)
				Treat stormwater	NO (2)	NO (2)	NO (3)
					(2)	(2)	(2)
Alternative Summary Rating				8	9	9	11
Alternative Ranking				2	2	2	3

*The duration of simulation period was 99.4 hours.
 ***"untreated" overflows means overflow events where solids, solum, oil, and small and large floatables are not controlled in the overflow.
 To avoid toxicity, all chlorinated CSO discharges are assumed to be dechlorinated as well
 - Indicates non-attainment of use during wet and dry weather.

WATER QUALITY IMPACTS OF CSO ALTERNATIVES FOR UPPER MYSTIC RIVER

Use	Use Attainment	Parameter *	Measures	Future Planned Conditions	UM-1 Sewer Separation of SOM007 and CSO Relocation	UM-2 Sewer Separation of SOM007 and Continue Treatment at SOM007A
Swimming (islanding)	-	bacteria *	Tot 1 Yr Storm Load (lbs) ***	2,83E+14	1,68E+14	2,22E+14
Aesthetics	-	slicks (solids, oil, scum)	Vol. of "untreated" overflows ** after 1 yr storm after 3 mo storm	0.03 0.00	(2) 0.00	0.00 0.00
Aquatic life	-	sediment	Total TSS load (lbs) *** after 1 yr storm after 3 mo storm	23,900 13,300	(1) 13,500 11,200	20,900 11,140
Alternative Performance			Level of Control		(1) I	(2) II
			# of untreated overflows/yr **	2	(1) 0	(1) 0
			Closure of CSOs	0	(1) 2	(2) 1
			Treat stormwater	N	(2) N	(2) N
Alternative Summary Rating					7	9
Alternative Ranking					1	2

*The duration of simulation period was 99.4 hours.

**"untreated" overflows defined as receiving coarse screening only, or less

***Total load includes CSO, stormwater, and boundary load

- Indicates non-attainment of use during wet and dry weather.

0 Indicates non-attainment of use during wet weather.

WATER QUALITY IMPACTS OF CSO ALTERNATIVES FOR UPPER INNER HARBOR

Use	Use Attainment	Parameter	Measures	Future Planned Conditions	U/IH-1	U/IH-2	U/IH-3
Swimming (seilboarding)	-	bacteria *	Tot 1 Yr Storm Load (lbs) ***	1.77E + 16	(1)	(1)	(1)
			hours > 200 after 1 yr storm	38.3	(1)	(1)	(1)
Boating	0	bacteria	hours > 1000 after 1 yr storm	0.0	(2)	(2)	(2)
Aesthetics	-	slicks (solids, oil, scum)	vol. of "untreated" overflows (MG) **	0.0	(1)	(1)	(1)
			after 1 yr storm	5.81	0	0	0
			after 3 mo storm	1.46	(1)	(1)	0
Aquatic life	-	DO - BOD	CSO TSS load (plumes)(lbs) after 1 yr storm	48,600	(1)	(1)	1
			after 3 mo storm	18,200	0	0	19,300
			total BOD load (lbs) *** after 1 yr storm	159,000	(1)	(1)	1100
			after 3 mo storm	111,000	(1)	(1)	148,000
		sediment	Total TSS load (lbs) *** after 1 yr storm	134,000	(2)	(2)	102,000
			after 3 mo storm	82,800	(1)	(1)	(2)
			Laval of Control	36	(1)	(1)	105,000
			# of untreated overflows/year	36	(2)	(2)	65,700
Alternative Performance			Closure of CSOs	0	(1)	(1)	(2)
			Treat stormwater	N	10	(2)	0 - 3
Alternative Summary Rating				N	N	N	N
Alternative Ranking				7	8	8	8
				1	2	2	2

*The duration of simulation period was 99.4 hours.
 Sample location at the mouth of Charles River.
 ***"untreated" overflows defined as receiving coarse screening only, or less
 ***Total load includes CSO, stormwater, and boundary loads.

- Indicates non-attainment of use during wet and dry weather.
 0 Indicates non-attainment of use during wet weather.

WATER QUALITY IMPACTS OF CSO ALTERNATIVES FOR UPPER INNER HARBOR

	Use Attainment	Parameter	Measures	UIH-4	UIH-5	UIH-6
Swimming (selfboating)	-	bacteria *	Tot 1 Yr Storm Load (lbs) ***	(1)	(1)	(2)
			hours > 200 after 1 yr storm	1.12E+16 (2)	6.80E+15 (1)	1.59E+16 (2)
Boating	0	bacteria	hours > 1000 after 1 yr storm	NA (2)	NA (2)	NA (2)
			vol. of "untreated" overflows (MG) ** after 1 yr storm after 3 mo storm	0.0 (1)	0.0 (1)	0.0 (2)
Aesthetics	-	slicks (solids, oil, scum)	after 1 yr storm after 3 mo storm	3.78 (1)	1.24 (1)	5.81 (2)
			CSO TSS load (plumes)(lbs) after 1 yr storm after 3 mo storm	19,800 (1) 0 (1)	39,400 (1) 6,600 (1)	44,700 (2) 15,900 (2)
Aquatic life	-	DO -BOD	total BOD load (lbs) *** after 1 yr storm after 3 mo storm	(2) 146,000 101,000 (2)	(2) 155,000 106,000 (2)	(2) 158,000 110,000 (2)
		sediment	Total TSS load (lbs) *** after 1 yr storm after 3 mo storm	(2) 105,000 64,800 (2)	(2) 125,000 71,200 (2)	(2) 130,000 80,500 (2)
Alternative Performance			Level of Control	(2)	(2)	(3)
			# of untreated overflows/year	II (2)	II (2)	III (3)
				1 - 9 (3)	1 - 9 (2)	36 (3)
			Closure of CSOs	(3)	(2)	(3)
			Treat stormwater	0 (2)	0 - 2 (2)	0 (2)
				N (2)	N (2)	N (2)
Alternative Summary Rating			9	8	11	
Alternative Ranking			2	2	3	

*The duration of simulation period was 99.4 hours.
 Sample location at the mouth of Charles River.
 **"untreated" overflows defined as receiving coarse screening only, or less
 ***Total load includes CSO, stormwater, and boundary loads.
 - Indicates non-attainment of use during wet and dry weather.
 0 Indicates non-attainment of use during wet weather.

WATER QUALITY IMPACTS OF CSO ALTERNATIVES FOR LOWER INNER HARBOR

Use	Use Attainment	Parameter	Measures (CSO, SW, Boundary)	Future Planned Conditions	LIH-1		LIH-2		LIH-3	
					Complete Sewer Separation		Consolidation to Near Surface Storage (1 yr)		Consolidation to Primary Treatment (1 yr)	
Swimming (sailboarding)	0	bacteria *	Tot 1 Yr Storm Load (lbs) *** hours > 200	2,01E+16	(1) 1.14E+16	1	(1) 1.03E+16	1	(1) 1.03E+16	2
Boating	0	bacteria	hours > 1000	37.2	(1) 15.5		(1) 23.8		(2) NA	
Aquatic life	-	DO-BOD	hours after 1 yr storm	4.1	(1) 0.0	1	(1) 0.0	1	NA	1
			CSO, SW BOD load (lbs) after 1 yr storm	17,700	(2) 16,200		(2) 14,800		(2) 16,100	
			after 3 mo storm	9,750	(3) 10,100		(2) 9,240		(2) 9,240	
		sediment	CSO + SW load TSS (lbs) after 1 yr storm	33,700	(2) 31,200	2	(2) 28,100	2	(2) 30,100	2
			after 3 mo storm	18,700	(3) 19,400		(2) 17,800		(2) 17,800	
Alternative Performance				Level of Control	(1) I		(2) II		(2) II	
				# of untreated overflows/yr **	(1) 0		(2) 1 - 3		(1) 0	
				Closure of CSOs	(1) 5	1	(2) 1 - 4	2	(2) 1 - 4	2
				Treat stormwater	N		(2) N		(2) Y	
Alternative Summary Rating					N		N		N	
Alternative Ranking					5		6		7	
					1		2		2	

*The duration of simulation period was 99.4 hours.

Sample location at Middle Inner Harbor.

**"untreated" overflows defined as receiving coarse screening only, or less

***Total load includes CSO and stormwater load

- Indicates non-attainment of use during wet and dry weather.

0 Indicates non-attainment of use during wet weather.

WATER QUALITY IMPACTS OF CSO ALTERNATIVES FOR LOWER INNER HARBOR

Use	Use Attainment	Parameter	Measures	LIH-4 Interceptor Relief (3 mo)	LIH-5 Diversion to Storage (3 mo)	LIH-6 Coarse Screening
Swimming (seilboarding)	0	bacteria*	Tot 1 Yr Storm Load (lbs) *** (CSO, SW, Boundary) hours > 200 after 1 yr storm	(2) 1,85E+16 (1) 15.5 (1) 0.0	(2) 1,85E+16 (1) NA (1) NA	(2) 2.01E+16 (2) NA (2) NA
Boating	0	bacteria	hours > 1000 after 1 yr storm	(2) 17,200 9,240 (2) (2) 32,500 17,800	(2) 17,200 9,240 (2) (2) 32,500 17,800	(2) 17,700 9,750 (2) (2) 33,400 18,700
Aquatic life	-	DO-BOD	CSO, SW BOD load (lbs) after 1 yr storm after 3 mo storm	(2) 17,200 9,240 (2) (2) 32,500 17,800	(2) 17,200 9,240 (2) (2) 32,500 17,800	(2) 17,700 9,750 (2) (2) 33,400 18,700
		sediment	CSO + SW load TSS (lbs) after 1 yr storm after 3 mo storm	(2) 17,200 9,240 (2) (2) 32,500 17,800	(2) 17,200 9,240 (2) (2) 32,500 17,800	(2) 17,700 9,750 (2) (2) 33,400 18,700
Alternative Performance				Level of Control	(2) II	(3) III
				# of untreated overflows/yr **	(2) 1 - 5	(3) 29
				Closure of CSOs	(3) 0	(3) 0
				Treat stormwater	(2) N	(2) N
Alternative Summary Rating				7	7	9
Alternative Ranking				2	2	3

*The duration of simulation period was 99.4 hours.
Sample location at Middle Inner Harbor.
**"untreated" overflows defined as receiving coarse screening only, or less
***Total load includes CSO and stormwater load

- Indicates non-attainment of use during wet and dry weather.
0 Indicates non-attainment of use during wet weather.

WATER QUALITY IMPACTS OF CSO ALTERNATIVES FOR MYSTIC / CHELSEA CONFLUENCE

Use	Use Attainment	Premature bacteria *	Measures	Future Planned Conditions	MCC-1	MCC-2	MCC-3	MCC-4
Swimming (sailboarding)			Total 1 yr Storm Load (lbs) *** hours > 200 after 1 yr storm	2.16E+16 MR: 34.2 CC: 34.2	Complete Sewer Separation (2) 1.94E+16 MR: 27.9 CC: 26.9	Storage at MWR205, BOS014, BOS017 and CHE008 (1 yr) (1) 1.42E+16 MR: 26.9 CC: 24.9	Primary Treatment at et MWR205, BOS014, BOS017 and CHE008 (1 yr) (2) 1.43E+16	Dechlorination at MWR205; Screen and Disinfect at BOS014, BOS017 and CHE008 (1 yr) (1) 1.43E+16
Boating	0	bacteria	hours > 1000 after 1 yr storm	MR: 0.0 CC: 10.4	MR: 0.0 CC: 0.0	MR: 0.0 CC: 0.0	NA	NA
Aesthetics	0	slicks (solids, oil, scum)	Vol. "untreated" overflows ** after 1 yr storm after 3 mo storm	4.55 0.55	(1) 0	(1) 0	(1) 0	(1) 0
Aquatic life	-	DO - BOD	CSO TSS load (pounds)(lbs) after 1 yr storm after 3 mo storm	17,100 6,020	(1) 0	(1) 0	(1) 1	(1) 2
			Total storm BOD load (lbs) *** after 1 yr storm after 3 mo storm	29,400 10,100	(2) 17,200	(1) 20,000 12,700	(2) 24,700 13,700	(2) 29,400 16,100
		sediment	Total TSS load (lbs) *** after 1 yr storm after 3 mo storm	55,300 30,500	(2) 33,000	(2) 38,500 24,500	(2) 45,000 25,700	(2) 54,000 30,200
Alternative Performance								
			Level of Control	(1) I	(1) I	(2) II	(2) II	(2) II
			# of untreated overflows/yr **	35	(1) 0	(2) 1 - 3	(1) 0	(1) 0
			Closure of CSOs	0	(1) 8	(3) 2	(3) 2	(3) 2
			Treat stormwater	N	(2) N	(2) N	(2) N	(2) N
Alternative Summary Rating								
				8	8	8	8	9
				8	8	8	8	9

*The duration of simulation period was 99.4 hours.
 Sample locations at Mystic River, near the mouth (MR) and Chelsea Creek, near the mouth (CC).
 ***"untreated" overflows defined as receiving coarse screening only, or less.
 ***Total load includes CSO, stormwater and boundary loads
 - Indicates non-attainment of use during wet and dry weather.
 0 Indicates non-attainment of use during wet weather.

WATER QUALITY IMPACTS OF CSO ALTERNATIVES FOR MYSTIC / CHELSEA CONFLUENCE

Use	Use Attainment	Parameter	Measures	MCC-5	MCC-6	MCC-7
Swimming (lifeguarding)	-	bacteria*	Total 1 yr Storm Load (lbs) *** hours > 200 after 1 yr storm	Storage at MWR205, BOS014, BOS017 and CHE008 (3 mol) (2) 1.55E+18 MR 28.0 CC 28.0	Primary Treatment at MWR205, BOS014, BOS017 and CHE008 (3 mol) (2) 1.55E+18	Storage at MWR205, Bosraan and Dianfect at BOS014, BOS017 and CHE008 (3 mol) (1) 1.43E+18 (2) NA
Boating	0	bacteria	hours > 1000 after 1 yr storm	MR 0.0 CC 2.1	NA	NA
Aesthetics	0	slits (solids, oil, scum)	Vol. "untreated" overflowe ** after 1 yr storm after 3 mo storm	(2) 4 (1) 0	(1) 0 (2) 0 (1) 0	(1) 0 (2) 0 (1) 0
			CSO TSS load (plumes/lbs) after 1 yr storm after 3 mo storm	(1) 10,400 (2) 0	(2) 12,700 (1) 2,280	(1) 10,700 (2) 370
Aquatic life	-	DO -BOD	Total storm BOD load (lbs) *** after 1 yr storm after 3 mo storm	(2) 26,000 (1) 12,700	(2) 27,700 (1) 14,400	(2) 26,200 (1) 13,000
		sediment	Total TSS load (lbs) *** after 1 yr storm after 3 mo storm	(2) 48,900 (1) 24,500	(2) 51,200 (1) 26,800	(2) 49,200 (1) 24,900
Alternative Performance				Level of Control (2) II (1) 4 - 17	(2) II (1) 0	(2) II (1) 0
				# of untreated overflow/yr **	(1) 0	(1) 0
				Closure of CSOs	(3) 0 (2) 0	(3) 0 (2) 0
				Treat stormwater	(2) N (1) N	(2) N (1) N
Alternative Summary Rating				9	8	8
Alternative Ranking				9	8	8

* The duration of simulation period was 99.4 hours.

** Sample locations at Mystic River, near the mouth (MR) and Chelsea Creek, near the mouth (CC).

*** "untreated" overflows defined as receiving coarse screening only, or less.

**** Total load includes CSO, stormwater and boundary loads

- Indicates non-attainment of use during wet end dry weather.

0 Indicates non-attainment of use during wet weather.

WATER QUALITY IMPACTS OF CSO ALTERNATIVES FOR RESERVED CHANNEL

Use	Use Attainment	Parameter	Measures	Future Planned Conditions	RC-1 Sewer Separation	RC-2 Consolidated Storage BOS076 - 060 (1 yr)	RC-3 Consolidated Storage BOS080 - 076 (1 yr)	RC-4 Consolidated Primary Treatment BOS076 to BOS080 (1 yr)	RC-5 Consolidated Primary Treatment BOS080 to BOS076 (1 yr)
Swimming (sailboarding)	0	bacteria	Tot 1 Yr CSO + SW Load (lbs) hours > 200 after 1 yr storm	1.92E+16 23.8	(1) 1.00E+15 (1) 0.0	(1) 8.00E+14 (1) 0.0	(1) 8.00E+14 (1) 0.0	(1) 8.00E+14 (1) 0.0	(1) 8.00E+14 (1) 0.0
Boating	+	bacteria *	hours > 1000 after 1 yr storm	0.0	(1) 0.0	(1) 0.0	(1) 0.0	(1) 0.0	(1) 0.0
Aquatic life	-	sediment	CSO + SW TSS load (lbs) after 1 yr storm after 3 mo storm	12,800 5,730	(1) 2,800 (1) 1,790	(1) 2,300 (1) 1,460	(1) 2,300 (1) 1,460	(1) 4,290 (1) 1,460	(1) 5,230 (1) 1,460
Alternative Performance			Level of Control	-	(1) (1)	(2) (2)	(2) (2)	(2) (2)	(2) (2)
			# of untreated overflow/yr **	44	1 0	II 1 - 3	II 1 - 3	II 0	II 0
			Closure of CSOs	0	(1) 4	(2) 0 - 2	(2) 0 - 2	(2) 0 - 2	(2) 0 - 2
			Treat stormwater	N	(2) N	(2) N	(2) N	(2) N	(2) N
Alternative Summary Rating				N	4	5	5	5	5
Alternative Ranking					1	2	2	2	2

*The duration of the simulation period was 99.4 hours.

Sample location at the mouth of Reserved Channel.

** "untreated" overflows defined as coarse screening only, or less

- Indicates non-attainment of use during wet and dry weather.

0 Indicates non-attainment of use during wet weather.

+ Indicates designated use is attained

WATER QUALITY IMPACTS OF CSO ALTERNATIVES FOR RESERVED CHANNEL

Use	Use Attainment	Parameter	Measures	RC-6 Consolidated Screen end Disinfection BOS078 - 080	RC-7 Consolidated Screen end Disinfection BOS080 - 078	RC-8 Consolidated Storage BOS078 - 080 (3 mol)	RC-9 Consolidated Storage BOS080 - 078 (3 mol)	RC-10 Consolidated Primary Treatment BOS080 to BOS078 (3 mol)	RC-11 Coarse Screens at Outfalls
Swimming (sailboarding)	0	bacteria	Tot 1 yr CSO + SW Load (lbs) hours > 200 after 1 yr storm	(1) 9,00E+14 1 (1) 0.0	(1) 1.00E+15 1 (1) 0.0	(1) 9,00E+15 1 (1) 0.0	(1) 9,00E+15 1 (1) 0.0	(1) 9,00E+15 1 (1) 0.0	(2) 1.92E+16 2 (2) 23.8
Boating	+	bacteria *	hours > 1000 after 1 yr storm	(1) 0.0 1	(1) 0.0 1	(1) 0.0 1	(1) 0.0 1	(1) 0.0 1	(1) 0.0 1
	.	sediment	CSO+SW TSS load (lbs) after 1 yr storm after 3 mo storm	(2) 9,360 2,900 2 (1)	(2) 1 10,940 4,090 2 (2)	(1) 9,210 1,480 1 (1)	(1) 8,210 1,480 1 (1)	(1) 8,950 1,920 1 (1)	(2) 1.2,273 5,516 2 (2)
Alternative Performance				(2) Level of Control	(2) # of untreated overflows/yr **	(2) II	(2) II	(2) II	(3) III
				(1) 0	(1) 0	(2) 4 - 6	(2) 4 - 6	(1) 0	(3) 44
				(2) Closure of CSOs	(2) 0 - 2	(2) 0 - 2	(2) 0 - 2	(2) 0 - 2	(3) 0
				(2) Treat stormwater	(2) N	(2) N	(2) N	(2) N	(2) 0
Alternative Summary Rating				5	5	5	5	5	5
Alternative Ranking				2	2	2	2	2	2

*The duration of the simulation period was 99.4 hours.

Sample location at the mouth of Reserved Channel.

**"untreated" overflows defined as coarse screening only, or less

- Indicates non-attainment of use during wet and dry weather.

0 Indicates non-attainment of use during wet weather.

+ Indicates designated use is attained

WATER QUALITY IMPACTS OF CSO ALTERNATIVES FOR FORT POINT CHANNEL

Use	Use Attainment	Parameter	Measures	Future Planned Conditions	FPC1		FPC2		FPC3		FPC4	
					Sewer Separation		Coarse Screen BOS062-068; Det/Treat UPPS; In-line store DBC; Stor/Consd conduit BOS072, 073 (3-mo)		Coarse Screen BOS062-068; Screen/Disint. UPPS; In-line Store DBC; Indiv. screen/ Disinfect BOS072, 073 (3-mo)		Coarse Screening BOS062-068; BOS072, 073 In Recirculating Water Control, BOS070	
Boating	-	bacteria	hours > 1000 after 1 yr storm	19.7	(1)	1	(1)	1	(1)	0	(1)	2
Swimming	-	bacteria *	total 1 yr storm load	6.08 E14	1.58 E14	(1)	0.52 E14	(1)	0.52 E14	(1)	6.08 E14	2
			hours > 200	40.4	23.8	(1)	(1)	(1)	23.8	(1)	(2)	(2)
Aesthetics	-	slicks (solids, oil, scum)	vol of "untreated" overflows ** after 1 yr storm (MG)	27.75	0	0	0.22	(1)	0.22	(1)	27.75	(2)
			after 3 mo storm (MG)	9.12	(1)	(1)	(1)	(1)	(1)	(1)	9.12	(2)
			CSO TSS load (pulses) (lbs)	32,400	(1)	1	(2)	(1)	(2)	(2)	(2)	2
			after 1 yr storm	10,700	0	(1)	24,600	(1)	27,500	(2)	30,800	(2)
			after 3 mo storm		(1)	(1)	6,940	(2)	9,860	(2)	10,100	(2)
Aquatic life	-	DO -BOD	total storm BOD (lbs) after 1 yr storm	24,200	(2)	(2)	(2)	(2)	22,250	(2)	24,200	(2)
			after 3 mo storm	9,860	14,250	(3)	7,990	(2)	9,897	(2)	9,860	(2)
		sediment	CSO + SW load TSS (lbs) after 1 yr storm	44,200	(3)	3	(2)	(2)	(2)	(2)	(2)	2
			after 3 mo storm	18,200	43,200	(3)	38,360	(2)	39,290	(2)	42,680	(2)
					27,400	(3)	14,490	(2)	17,390	(2)	17,456	(2)
			Level of Control		1	(1)	II, 3 mo.	(2)	II, 3 mo.	(2)	III	(3)
			# of untreated overflows/year	40	0	(1)	4-7	(2)	4-7	(2)	40	(3)
			Closure of CSOs	-	7	1	(2)	(2)	0	(2)	0	3
			Treat stormwater		(1)	(1)	NO	(2)	NO	(2)	NO	(3)
					NO	NO	NO	NO	NO	NO	NO	NO
Alternative Summary Rating					7	7	7	7	8	8	11	11
Alternative Ranking					1	1	1	1	2	2	3	3

*The duration of simulation period was 99.4 hours
 ***"untreated" overflows means overflow events where solids, scum, oil, and small and large floatables are not controlled in the overflow.
 Swimming standard is currently met in dry and damp weather
 To avoid toxicity, all chlorinated CSO discharges are assumed to be dechlorinated as well
 D.O. frequently below standard
 - Indicates non-attainment of use during wet and dry weather.

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APPENDIX D
COST RATING TABLES

COST OF CSO ALTERNATIVES IN NORTH DORCHESTER BAY

	NDB1 Sewer Separation	NDB2 CSO Relocation to Reserve Channel	NDB3 Consolidation/ Storage Conduit (1 Yr)	NDB4 Interceptor Relief; System Optimization 081,082 (1 Yr)	NDB5 Consolidation/Storage Conduit (3 Mo)
Capital Cost \$ Million	80.9	78.9	41.4	22.3	26.5
Annual O&M Cost \$	0	250,000	99,000	0	99,000
Present Worth \$ Million	65	65.9	34.3	18	22.3
Alternative Ranking	3	3	2	1	2

COST OF CSO ALTERNATIVES IN SOUTH DOCHESTER BAY

	SDB1 Sewer Separation	SDB2 Indiv. Storage Tanks at BOS090, 088/089 (1 Yr)	SDB3 Consolidated Storage Facility at Fox Point (1 Yr)	SDB4 Indiv. Primary Treat at BOS090, 088/089 (1Yr)	SDB5 Upgrade Existing Facilities for Dechlorination (1 Yr)
Capital Cost \$ Million	88.4	93.6	101	29	3
Annual O&M Cost \$	0	1,300,000	1,290,000	1,613,000	600,000
Present Worth \$ Million	74.3	89.8	95.2	41.7	9.1
Alternative Ranking	3	3	3	2	1

COST OF CSO ALTERNATIVES IN SOUTH DOCHESTER BAY

	SDB6		SDB7		SDB8	
	Indiv. Storage Tanks at BOS090, 088/089 (3 Mo)		Consolidated Storage at Fox Point (3 Mo)		Indiv. Primary Treat at BOS090, 088/089 (3 Mo)	
Capital Cost \$ Million	42		51.7		20.8	
Annual O&M Cost \$	1,100,000		1,089,000		1,361,000	
Present Worth \$ Million	46.1		53.8		31.9	
Alternative Ranking	2		2		2	

COST OF CSO ALTERNATIVES IN NEPONSET RIVER

	N1	N2	N3	N4
	Sewer Separation	Indiv. Near Surface Storage Tanks at BOS095 & 093 (1 Yr)	Storage at BOS093 and Primary Treat at BOS095 (1 Yr)	Consolidated Near Surface Primary Treatment Near BOS093 (1 Yr)
Capital Cost \$ Million	10.7	17.8	10.4	18.8
Annual O&M Cost \$	0	314,000	367,000	113,000
Present Worth \$ Million	8.6	17.8	12.5	16.4
Alternative Ranking	2	3	3	3

COST OF CSO ALTERNATIVES IN NEPONSET RIVER

	N5 Indiv. Screen/Disinfect/ Dechlor at BOS093, 095 (1 Yr)	N6 Indiv. Storage Tanks at BOS095, 093 (3 Mo)	N7 Coarse Screen at Outfalls
Capital Cost \$ Million	4.7	4.9	1.7
Annual O&M Cost \$	231,000	224,000	101,000
Present Worth \$ Million	6.4	6.4	2.8
Alternative Ranking	2	2	1

COST OF CSO ALTERNATIVES FOR CONSTITUTION BEACH

	CB-1	CB-2	CB-3	CB-4
	Complete Sewer Separation	Moore Street Interceptor Relief (1-Yr) (1-Yr)	Near Surface Storage (1-Yr) Storage (1-Yr)	Near Surface Storage (3-Mo)
Capital Cost Millions \$	8.7	7.0	5.7	2.0
Annual O&M Cost	0	0	46,368	18,768
Present Worth Millions \$	7.0	5.6	5.1	1.8
Alternative Ranking	3	2	2	1

COST OF CSO ALTERNATIVES FOR UPPER CHARLES RIVER

	UC-1	UC-2	UC-3	UC-4	UC-5	UC-6	UC-7
	Complete Sewer Separation	Sewer Separation at CAM005, CAM009 & BOS032	Storage at CAM005, CAM009 & Enlarge Int. Conn. @BOS032 (1-Yr)	Primary Treat. at CAM005 & BOS032; Storage at CAM009 (1-Yr)	Less Than Primary Treat. at CAM005, CAM009 & BOS032 (1-Yr)	Screening at CAM005, CAM009 and Enlarge Int Conn. at BOS032 (3-Mo)	Screening at CAM005, CAM009 and BOS032
Capital Cost \$ Millions	87.2	27.5	11.8	8.1	5.1	0.0	1.0
Annual O&M Cost \$	0	0	100000	160000	140208	11040	33120
Present Worth \$ Millions	70.1	22.1	10.5	8.1	5.5	0.1	0.7
Alternative Ranking	3	2	2	2	2	1	1

COST OF CSO ALTERNATIVES IN LOWER CHARLES RIVER

	LC1	LC2	LC3	LC4	LC5	LC6
	Sewer Separation	Stony Brook cons. to storage; Cottage Farm storage, 1-yr	Stony Brook cons. to storage w/divers. at 046-381; Cottage Farm storage, 3-mo	Stony Brook cons. to screen/disinfect.; Cottage Farm storage, 3-mo	Stony Brook screen/disinfection of SBC; Cottage Farm detention/disinfection, 3-mo	Swirl Concentrator on DEC, foul flow pump to HLS; Cottage Farm detention/disinfection
Capital Cost \$ Million	485	249	98.4	73.7	26.5	61.9
Annual O&M Cost \$	0	1,400,000	1,000,000	800,000	1,000,000	1,700,000
Present Cost \$ Million	390	215.5	90.3	68.2	32.5	71.8
Alternative Ranking	3	3	2	2	1	2

COST OF CSO ALTERNATIVES IN ALEWIFE BROOK

	AB1	AB2	AB3	AB4	AB5	AB6	AB7	AB8
	Sewer Separation	Consolidated Near Surface Storage Facility (1-yr)	Consolidation/Storage Conduit (1 Yr)	Consolidated Near Surface Storage w/ Separation at CAM 004 (1 Yr)	Consolidation/Storage Conduit w/ Separation at CAM 004 (1 Yr)	Separation of CAM 004 (3-mo)	Consolidation/Storage Conduit (3 Mo)	Coarse Screening at Outfalls
Capital Cost \$ Million	55	54.1	68.5	38.8	47.7	3.4	32.8	7.4
Annual O&M Cost \$	0	362,000	50,000	291,000	30,000	0	40,000	50,000
Present Worth \$ Million	44.2	47.6	55.6	34.4	38.7	2.8	26.8	6.4
Alternative Ranking	3	3	3	2	2	1	2	1

COST OF CSO ALTERNATIVES FOR UPPER MYSTIC

	UM-1	UM-2	UM-3
	Sewer Sep at SOM007 & CSO Relocation at SOM007A	Install Screens at SOM007; Cont Treat. at SOM MARG 007A	Sewer Sep at SOM007 Cont. Treat. at Som. Marg 007A
Capital Cost \$ Millions	23.3	0.1	0.1
Annual O&M Cost \$	163,392	5,520	5,520
Present Worth \$ Millions	20.4	0.1	0.1
Alternative Ranking	2	1	1

COST OF CSO ALTERNATIVES FOR UPPER INNER HARBOR

	UIH-1	UIH-2	UIH-3
	Complete Sewer Separation	1-Yr Storage at MWR203, BOS019; Consol. to Storage BOS009-013; Consol/Storage Conduit BOS057/060; Screens BOS 050, 052	1-Yr Primary Tr. MWR203, BOS019; Consol. to Primary Tr. BOS009-013; Consol/Storage Conduit BOS057-060; Screens BOS050, 052
Capital Cost \$ Millions	88.5	214.0	108.9
Annual O&M Cost	0	1,691,328	2,089,872
Present Worth \$ Millions	71.2	189.2	108.7
Alternative Ranking	2	3	3

COST OF CSO ALTERNATIVES FOR UPPER INNER HARBOR

	UIH-4	UIH-5	UIH-6
	3-Mo Storage MWR203, BOS019; Int.. Relief BOS009-013; Screens BOS050-060;	3-Mo Primary Tr. MWR203, BOS019; Consol to Primary Tr. BOS009-013; Screens BOS050-060;	1-Yr Less Than Primary Tr. MWR203; Coarse Screens BOS019, BOS009-013,BOS050-060;
Capital Cost \$ Millions	84.8	60.0	12.1
Annual O&M Cost	1,181,280	1,812,768	1,068,672
Present Worth \$ Millions	80.2	66.6	20.6
Alternative Ranking	2	2	1

COST OF CSO ALTERNATIVES FOR LOWER INNER HARBOR

	LIH-1	LIH-2	LIH-3	LIH-4	LIH-5	LIH-6
	Complete Sewer Separation	Consolidation to Near Surface Storage BOS003 to BOS007(1-Yr) (1)	Consolidation to Primary Treatment (1-Yr)	Interceptor Relief (3-Mo)	Diversion to Storage in BOS003 Outfall (3-Mo)	Coarse Screening
Capital Cost Millions \$	58.4	42.8	32.9	19.6	14.5	13.1
Annual O&M Cost	0	474,584	593,385	0	66,240	38,640
Present Worth Millions \$	46.9	39.3	32.5	15.7	12.3	11.0
Alternative Ranking	3	3	2	1	1	1

COST OF CSO ALTERNATIVES FOR MYSTIC/CHELSEA CONFLUENCE

	MCC-1	MCC-2	MCC-3	MCC-4
	Complete Sewer Separation	1-Yr Storage MWR205, BOS017, CHE008, BOS014	1-Yr Primary Treat. MWR205, BOS017, CHE008, Storage BOS014	1-Yr Dechlor. MWR205, Screen & Disinfect. BOS017, CHE008, BOS014
Capital Cost Millions \$	112.6	75.4	39.4	7.2
Annual O&M Cost	0	666,816	1,386,624	824,688
Present Worth Millions \$	90.5	67.4	45.8	14.2
Alternative Ranking	3	3	3	1

COST OF CSO ALTERNATIVES FOR MYSTIC/CHELSEA CONFLUENCE

	MCC-5	MCC-6	MCC-7
	3-Mo Storage MWR205, BOS017, CHE008, Coarse Screen at BOS014	3-Mo Primary Treat. MWR205, BOS017, Storage at CHE008, Screen BOS014	3-Mo Storage MWR205, BOS017, CHE008, Coarse Screen at BOS014
Capital Cost Millions \$	29.9	16.0	25.2
Annual O&M Cost	377,568	701,040	773,904
Present Worth Millions \$	27.9	20.0	28.1
Alternative Ranking	2	2	2

COST OF CSO ALTERNATIVES FOR RESERVED CHANNEL

	RC-1	RC-2	RC-3	RC-4	RC-5	RC-6
	Complete Sewer Separation	CSO Relocation to Fort Point Channel	Consolidated Near Surface Storage Facility BOS076 to BOS080 (1-Yr)	Consolidated Near Surface Storage Facility BOS080 to BOS076 (1-Yr)	Consolidated Near Surface Primary Treat. Facility BOS076 to BOS080 (1-Yr)	Consolidated Near Surface Primary Treat. Facility BOS080 to BOS076 (1-Yr)
Capital Cost \$ Millions	54.8	0.0	68.1	65.5	57.3	49.5
Annual O&M Cost	0	1,553,32B	567,456	570,106	1,153,680	1,157,544
Present Worth \$ Millions	44.0	15.8	60.5	58.4	57.8	51.5
Alternative Ranking	2	1	3	3	3	3

COST OF CSO ALTERNATIVES FOR RESERVED CHANNEL

	RC-7 Consolidation Screen/ Disinfection Facility BOS078 to BOS080 (1-Yr)	RC-8 Consolidation Screen/ Disinfection Facility BOS080 to BOS078 (1-Yr)	RC-9 Consolidated Near Surface Storage Facility BOS078 to BOS080 (3-Mo)	RC-10 Consolidated Near Surface Storage Facility BOS080 to BOS078 (3-Mo)	RC-11 Consolidated Near Surface Primary Treat. Facility BOS080 to BOS078 (3-Mo)	RC-11 Coarse Screens at Outfalls
Capital Cost \$ Millions	41.3	33.4	41.6	40.6	38.1	4.0
Annual O&M Cost	607,200	609,408	389,712	544,272	1,092,960	262,752
Present Worth \$ Millions	39.3	33.0	37.4	38.1	41.7	5.9
Alternative Ranking	2	2	2	2	2	1

COST OF CSO ALTERNATIVES FOR FORT POINT CHANNEL

	FPC1	FPC2	FPC3	FPC4
	Sewer Separation	Coarse Screen BOS062-068; Det/Treat UPPS; In-line store DBC; Stor/Consol conduit BOS072, 073 (3-mo)	Coarse Screen BOS062-068; Screen/Disinf. UPPS; In-line Store DBC; Indiv. screen/ Disinfect BOS072, 073 (3-mo)	Coarse Screen BOS062-068; BOS072, 073 In Receiving Water Control, BOS070
Capital Cost \$ Million	250	26.1	13.7	2.5
Annual O&M Cost \$	0	1,376,000	923,000	352,000
Present Worth \$ Million	200.8	34.9	20.4	5.6
Alternative Ranking	3	2	2	1

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APPENDIX E

SITE SCREENING AND RATING TABLES



RATING OF SITING ISSUES FOR NORTH DORCHESTER BAY

PARAMETER	NUMERICAL VALUE/ MEASURE	NOB-1	NOB-2	NOB-3	NOB-4	NOB-5
	Sewer Separation	37.3 Acres	CSO Relocation to Reserved Channel	Consolidation/Storage Conduit (1 year)	Relief of SSI, System op.	Consolidation, Near Surface Storage Conduit, (3 month)
	Primarily in existing ROWs		1.0 Acres, 11,000 L.F. Conduit	0.4 Acres, 7500 L.F. Conduit	9500 L.F.	0.4 Acres, 7500 L.F. Conduit
SITE AVAILABILITY	1) Multiple sitewise restrictions		Pipe located under beach or	Pipe located under Carson	Existing SBI/Day Boulevard	Pipe located under Carson
	2) Limited sitewise restrictions		Day Boulevard, Farragut Street (appears wide enough),	Beach and/or Day Boulevard		Beach and/or Day Boulevard
	3) No sitesevere restrictions	1	Power Plant 2	1	1	1
	o Residential					
	o Commercial/Industrial					
	o Vazair Hospital					
CONSTRUCTABILITY	1) Standard construction	Typical ROW	No construction during beach	Soft ground tunnel	Utility relocations	Complex traffic patterns, and difficult
	2) Construction constraints	construction issues	season (I on beach, marine terminal facilities may be underground	2	2	2
	3) Unique & for special construction required	2	3	Beach, traffic impacts	Traffic impacts on Day Boulevard disruption to bath houses and yacht clubs,	Bank of Boston, Bayside Expo, extensive road network/traffic issues
SHORT TERM COMMUNITY IMPACTS	1) Low	Local street closing	Traffic impacts, beach	2	2	3
	2) Moderate	2	Impacts, BHA housing, residences	2	2	2
	3) Severe	No maintenance or operations impacts	No maintenance or operations impacts. Assuming facility on Industrial site	Maintenance and operation impacts with storage and pump-out	Minor maintenance and operation impacts	Maintenance and operation impacts (pump station-odors)
LONG TERM COMMUNITY IMPACTS	1) Low	1	1**	2	1	2
	2) Moderate	Not Applicable	Beach area is a wetland resource	Beach area is a wetland resource	Beach area is a wetland resource	No impacts anticipated
	3) Severe					
ENVIRONMENTAL IMPACTS	1) Low					
	2) Moderate					
	3) Severe					
	o Hazardous Waste					
	o Wetlands					
	o Tidelands					
	o Other					
ALTERNATIVE RANKING		1	2	2	1	2

* Numerical values: 1 = Few, if any, implementation constraints; 2 = Potentially prohibits implementation
 ** Assessing facility at Quarry Terminal

RATING OF SITING ISSUES FOR SOUTHERN DORCHESTER BAY

PARAMETER	NUMERICAL VALUE/ MEASUR	SDB1		SDB2 / SDB4 / SDB6 / SDB8	
		Sewer Separation 706 Acres		Near Surface Storage BOS088/089-Fox Pt. and BOS090-Commercial Pt. (1 year)	
SITE AVAILABILITY o Vacant land o Park land o Residential o Commercial/Industrial o Vacant Industrial	1) Multiple sites/few restrictions 2) Limited sites/site restrictions 3) No site/severe restrictions	Primarily in existing ROWs		BOS088/089 1.9 Acres	BOS090 2.0 Acres
		1		Expansion at existing facility is especially tight	Armory property adjacent to Commercial Pt. - no space on existing site
CONSTRUCTABILITY	1) Standard construction 2) Construction constraints 3) Unique & /or special construction required	Typical ROW construction issues		2	2
		2		1	3
SHORT TERM COMMUNITY IMPACTS o Traffic impacts o Sensitive receptors	1) Low 2) Moderate 3) Severe	Local street closings		Rodent control	Traffic /truck access school, rodent control
		2		1	2
LONG TERM COMMUNITY IMPACTS o Public acceptance o Maintenance impacts o Operations impacts	1) Low 2) Moderate 3) Severe	No maintenance or operations impacts		Minor maintenance and operation impacts over existing conditions" temporary facility"	Minor maintenance and operation impacts over existing conditions" temporary facility"
		1		2	3
ENVIRONMENTAL IMPACTS o Hazardous Waste o Wetlands o Tidelands o Other	1) Low 2) Moderate 3) Severe	Not Applicable		Fox Pt. has some wetlands	Commercial Point does not appear to have Environmental impacts
		1		2	1
ALTERNATIVE SUMMARY/ RANKING					

* Numerical values: 1= Few, if any, implementation constraints; 2 = Potential difficult implementation; 3 = Potentially prohibits implementation.

RATING OF SITING ISSUES FOR SOUTHERN DORCHESTER BAY

PARAMETER	NUMERICAL VALUE/ MEASURE	SDB3 / SDB7		SDB5	
		Consolidation btw. Fox and Commercial Points, Near Surface Storage (1 year)	Upgrade facilities to Dechlorination at facility (1 year)	FOX Point 0.5 Acres	Commercial Point 0.5 Acres
SITE AVAILABILITY	1) Multiple sites/few restrictions 2) Limited sites/site restrictions 3) No site/severe restrictions	3.1 Acres, 4500 L.F. Conduit Consolidation problematic due to small residential streets; Access difficult	Limited space at existing facility	Some space available within site	
CONSTRUCTABILITY	1) Standard construction 2) Construction constraints 3) Unique & /or special construction required	3	Not Applicable	1	1
SHORT TERM COMMUNITY IMPACTS	1) Low 2) Moderate 3) Severe	2	No community impacts anticipated	1	1
LONG TERM COMMUNITY IMPACTS	1) Low 2) Moderate 3) Severe	2	Minor maintenance and operation impacts over existing conditions "temporary facility"	1	1
ENVIRONMENTAL IMPACTS	1) Low 2) Moderate 3) Severe	2	Minor maintenance and operation impacts over existing conditions "temporary facility"	2	2
ALTERNATIVE SUMMARY/RANKING		2	Not Applicable (positive impacts to shellfish)	Not Applicable (positive impacts to shellfish)	1

* Numerical values: 1 = Few, if any, implementation constraints; 2 = Potential difficult implementation; 3 = Potentially prohibits implementation.

RATING OF SITE ISSUES FOR NEPONSET

	N1	N4	N2
	Sewer Separation 68 Acres	Consolidation with Near Surface Storage at BOS093 (1 year) 0.6 Acres, 4,800 L.F. Conduit RR ROW (may be privately owned)	Near Surface Storage at BOS093,095 (1 year) BOS093 0.6 Acres
NUMERICAL VALUE/ MEASURE	Work Primarily in ROW	Best consolidation route in abandoned RR ROW (may be privately owned)	BOS093 site located adjacent to MDC Old Colony Division property
PARAMETER			
SITE AVAILABILITY	1 Multiple sites/low restrictions 2 Limited sites/site restrictions 3 No sites/severe restrictions	1 2	1 2
CONSTRUCTABILITY	1 Standard construction 2 Construction constraints 3 Unique & /or special construction required	Typical ROW construction issues	Small facilities- no construction constraints are apparent; Potential hazardous waste associated with vacant RR ROW and surrounding industrial uses
SHORT TERM COMMUNITY IMPACTS	1 Low 2 Moderate 3 Severe	Local street closings	Minor traffic impacts to local businesses
LONG TERM COMMUNITY IMPACTS	1 Low 2 Moderate 3 Severe	No maintenance or operations impacts	Minor odor issues to MDC building
ENVIRONMENTAL IMPACTS	1 Low 2 Moderate 3 Severe	Not Applicable	Wellands located between RR ROW and river bank for can be avoided.
ALTERNATIVE SUMMARY/RANKING			

Numerical values: 1= Few, if any, implementation constraints;
2=Potential difficult implementation;3 = Potentially prohibits implementation.

RATING OF SITE ISSUES FOR NEPONSET

		N3		N3	
PARAMETER	NUMERICAL VALUE/ MEASURE	Near Surface Storage Facility at BOS093 and Primary Treatment at BOS095 (1 year)		Near Surface Storage Facility at BOS093 and primary treatment at BOS095 (3 months)	
		BOS093 0.5 Acres	BOS095 0.5 Acres	BOS093 0.5 Acres	BOS095 0.5 Acres
SITE AVAILABILITY o Vacant land o Park land o Residential o Commercial/Industrial o Vacant Industrial	1) Multiple sitelot restrictions 2) Limited sitelot restrictions 3) No sitelot restrictions	Site located adjacent to MDC Old Colony Division property 1	Site appears available in Parking lot off of Old Colony Street between Mass Bay MRL and abandoned ROW, MDC access? 2	Site located adjacent to MDC Old Colony Division property 1	Site appears available in parking lot on Granite Street between Mass Bay MRL and abandoned RR ROW 2
	1) Standard construction 2) Construction constraints 3) Unique & for special construction required	Small facilities- no construction constraints are apparent; Potential hazardous waste associated with vacant RR ROW and surrounding industrial uses 1	Small facilities- no construction constraints are apparent; Potential hazardous waste associated with vacant RR ROW and surrounding industrial uses 1	Small facilities- no construction constraints are apparent; Potential hazardous waste associated with vacant RR ROW and surrounding industrial uses 1	Small facilities- no construction constraints are apparent; Potential hazardous waste associated with vacant RR ROW and surrounding industrial uses 1
SHORT TERM COMMUNITY IMPACTS o Traffic impacts o Sensitive receptors	1) Low 2) Moderate 3) Severe	Minor traffic impacts to local business 1	Potential impacts to Cedar Grove Cemetery (vibrations), parking impacts to lot(site), local traffic impacts from construction vehicle(Gallivan Blvd.) 1	Minor traffic impacts to local business 1	Potential impacts to Cedar Grove Cemetery (vibrations), parking impacts to lot(site), local traffic impacts from construction vehicle(Gallivan Blvd.) 1
	1) Low 2) Moderate 3) Severe	Minor odor issues to MDC building 2	Minor odor issues to MDC building 2	Minor odor issues to MDC building 2	Minor odor issues to Cedar Grove Cemetery 2
LONG TERM COMMUNITY IMPACTS o Public acceptance o Maintenance impacts o Operations Impacts	1) Low 2) Moderate 3) Severe	Wellands located between RR ROW and river bank can be avoided 2	Wellands located between RR ROW and river bank can be avoided 2	Wellands located between RR ROW and river bank can be avoided 2	Wellands located between RR ROW and river bank can be avoided 2
	1) Low 2) Moderate 3) Severe	Wellands located between RR ROW and river bank can be avoided 2	Wellands located between RR ROW and river bank can be avoided 2	Wellands located between RR ROW and river bank can be avoided 2	Wellands located between RR ROW and river bank can be avoided 2
ENVIRONMENTAL IMPACTS o Hazardous Waste o Wetlands o Tidelands o Other	1) Low 2) Moderate 3) Severe	Wellands located between RR ROW and river bank can be avoided 2	Wellands located between RR ROW and river bank can be avoided 2	Wellands located between RR ROW and river bank can be avoided 2	Wellands located between RR ROW and river bank can be avoided 2
ALTERNATIVE SUMMARY/RANKING					

Numerical values: 1= Few, if any, implementation constraints.
2=Potential difficult implementation,3 = Potentially prohibits implementation.

**CSO ALTERNATIVE SITE SCREENING
RECEIVING WATER: CONSTITUTION BEACH
CSO CONTROL SITE: CONSTITUTION BEACH CSO FACILITY, MOORE STREET INTERCEPTOR**

PARAMETER	NUMERICAL VALUE*/MEASURE	Sewer Separation	Relieve Moore Street Interceptor (1 year)	Near Surface Storage Facility at Constitution Beach (1 year)	Near Surface Storage Facility at Constitution Beach (3 month)
SITE AVAILABILITY <ul style="list-style-type: none"> • Vacant land • Park land • Residential • Commercial/Industrial • Vacant Industrial 	1) Multiple sites/few restrictions 2) Limited sites/site restrictions 3) No site/severe restrictions	Not Applicable	Not Applicable	Site available at existing facility and adjacent Massport property	Site available at existing facility and adjacent Massport property
CONSTRUCTABILITY	1) Standard construction 2) construction constraints 3) unique &/or special construction required	Not Applicable	Appears that the majority of the relief sewer could be open-cut trench	Standard construction is applicable	Standard construction is applicable
SHORT TERM COMMUNITY IMPACTS <ul style="list-style-type: none"> • Traffic impacts • Sensitive receptors 	1) Low 2) Moderate 3) Severe	Local street closings	Traffic impacts on local streets, residences bordering route, Orient Heights Beach, J.H.L. Noyes Playground impacted	Site access through Massport property, residences located opposite MBTA tracks on Moore Street	Site access through Massport property, residences located opposite MBTA tracks on Moore Street
LONG TERM COMMUNITY IMPACTS <ul style="list-style-type: none"> • Public acceptance • Maintenance impacts • Operations impacts 	1) Low 2) Moderate 3) Severe	No maintenance or operations impacts	No maintenance or operations impacts	Minor odor issues with storage facility to residences	Minor odor issues with storage facility to residences
ENVIRONMENTAL IMPACTS <ul style="list-style-type: none"> • Hazardous Waste • Wetlands • Tidelands • Other 	1) Low 2) Moderate 3) Severe	Not Applicable	Wetlands (local flooding) observed at J.H.L. Noyes Playground	Site is adjacent to tidal marsh within buffer zone	Site is adjacent to tidal marsh within buffer zone
ALTERNATIVE SUMMARY/RANKING					

*NUMERICAL VALUES: 1 = Few, if any, implementation constraints, 2 = Potentially difficult implementation, 3 = Potentially prohibits implementation.

**CSO ALTERNATIVE SITE SCREENING
RECEIVING WATER: UPPER CHARLES RIVER
CSO CONTROL SITE: CAM005, CAM009, RE032-1**

PARAMETER	NUMERICAL VALUE*/ MEASURE	Sewer Separation	Local storage at CAM005 & 009 (1 year), Interceptor connection at BOS032, Coarse screens at CAM007, 011, & BOS033	Separation BOS032, CAM005, CAM009, Coarse screen BOS033, CAM007, CAM011	Storage in BOS032 Overflow conduit, Coarse screen BOS033, CAM005, 003, 007, & 009	Coarse Screening at outfalls	Deep Rock Tunnel
SITE AVAILABILITY <ul style="list-style-type: none"> • Vacant land • Park land • Residential • Commercial/Industrial • Vacant industrial 	1) Multiple sites/few restrictions 2) Limited sites/site restrictions 3) No site/severe restrictions	Not Applicable	Storage site between MDC tot-lot and 1010 Mt. Auburn Street	Not Applicable	Site on corner North Beacon Street/Parsons street for storage tank/hydraulic pump	Not applicable (man-hole enlargements)	Tunnel/shaft located in parcel between MDC Int- lot and 1010 Mt. Auburn Street
CONSTRUCTABILITY	1) Standard construction 2) construction constraints 3) unique &/or special construction required	Not Applicable	Tight, sensitive site area - deep tunnel construction may be applicable	Not Applicable	Standard construction is applicable	Standard construction is applicable	Tunnel/shaft site is sensitive and tight
SHORT TERM COMMUNITY IMPACTS <ul style="list-style-type: none"> • Traffic impacts • Sensitive receptors 	1) Low 2) Moderate 3) Severe	Local street closings	Residences, tot-lot, school, traffic impacts to Mt. Auburn Street and Memorial Drive	Local Street closings	Minor traffic impacts to local businesses	Minor impact to traffic (man-hole construction/ work)	High-rise apartments, hospital, tot-lot, single-family housing, school
LONG TERM COMMUNITY IMPACTS <ul style="list-style-type: none"> • Public acceptance • Maintenance impacts • Operations impacts 	1) Low 2) Moderate 3) Severe	No maintenance or operations impacts	Minor odor issues, maintenance/operations traffic, aesthetics	No maintenance or operations impacts	No maintenance or operations impacts	Minor maintenance and operations impacts to traffic	Sycamore trees along Memorial Drive
ENVIRONMENTAL IMPACTS <ul style="list-style-type: none"> • Hazardous Waste • Wetlands • Tidelands • Other 	1) Low 2) Moderate 3) Severe	Not applicable	Sycamore trees on Memorial Drive	Not applicable	Potential for hazardous waste contamination	Not applicable	
ALTERNATIVE SUMMARY/RANKING							

*NUMERICAL VALUES: 1 = Few, if any, implementation constraints; 2 = Potentially difficult implementation; 3 = Potentially prohibits implementation.

RATING OF SITING ISSUES FOR LOWER CHARLES

PARAMETER	NUMERICAL VALUE/ MEASURE	LC1			LC2		LC3	
		Sewer Separation 1848 Acres	Stony Brook Consolidation to storage (1 year) Storage at Cottage Farm (1 year)		Stony Brook Cottage Farm Storage at Cottage Farm (1 year)		Stony Brook Cottage Farm storage (3 months)	
SITE AVAILABILITY	<ul style="list-style-type: none"> Multiple sites/few restrictions Vacant land Park land Residential Commercial/Industrial Vacant industrial 	Primarily in existing ROWs	2.5 Acres, 13,600 L.F. Conduit	Storage at Cottage Farm (1 year)	Storage at Cottage Farm (1 year)	Storage at Cottage Farm (1 year)	Storage at Cottage Farm (1 year)	Storage at Cottage Farm (1 year)
		1	2	1	1	1	1	1
CONSTRUCTABILITY	<ul style="list-style-type: none"> Standard construction Construction constraints Unique & /or special construction required 	Typical ROW construction issues	Conduit constraints in southwest corridor, potential hazardous waste located along southwest corridor ROW (soft ground tunneling)	Standard construction for storage tank	Standard construction for storage tank	Standard construction for storage tank	Standard construction for storage tank	Standard construction for storage tank
		2	3	2**	2	2	2	2
SHORT TERM COMMUNITY IMPACTS	<ul style="list-style-type: none"> Low Moderate Severe 	Local street closings	Conduit impacts to schools, elderly housing, parks, residences	Impacts to active park and school	Impacts to active park and school	Impacts to active park and school	Impacts to active park and school	Impacts to active park and school
		2	3	3	3	3	3	3
LONG TERM COMMUNITY IMPACTS	<ul style="list-style-type: none"> Low Moderate Severe 	No maintenance or operations impacts	O&M associated with storage facility, minor odor issues	O&M associated with storage facility, minor odor issues	O&M associated with storage facility, minor odor issues	O&M associated with storage facility, minor odor issues	O&M associated with storage facility, minor odor issues	O&M associated with storage facility, minor odor issues
		1	2	2	2	2	2	2
ENVIRONMENTAL IMPACTS	<ul style="list-style-type: none"> Low Moderate Severe 	Not Applicable	No wetlands observed	Wetland resources on river bank	Wetland resources on river bank	Wetland resources on river bank	Wetland resources on river bank	Wetland resources on river bank
		1	1	2	2	2	2	2
ALTERNATIVE SUMMARY/RANKING								

* Numerical values: 1 = Few, if any, implementation constraints; 2 = Potential difficult implementation; 3 = Potentially prohibitive implementation.

**Cottage Farm construction has the access and temporary road requirement issues

RATING OF SITING ISSUES FOR LOWER CHARLES

PARAMETER	NUMERICAL VALUE/ MEASURE	LC4		
		Charlesgate Gatehouse 0.5 Acres	BWSC Gatehouse	Cottage Farm 0.25 Acres
SITE AVAILABILITY o Vacant land o Park land o Residential o Commercial/Industrial o Vacant industrial	1) Multiple sites/few restrictions	Site available for screening / disinfection facility adjacent to Gatehouse	Site available in Fens Park adjacent to Gatehouse #1 & #2	Not applicable, utilization of existing facility
	2) Limited sites/site restrictions			
	3) No site/severe restrictions			
CONSTRUCT/ABILITY	1) Standard construction	1	2	1
	2) Construction constraints 3) Unique & /or special construction required	2**	Historic structure	Not applicable, utilization of existing facility
SHORT TERM COMMUNITY IMPACTS o Traffic impacts o Sensitive receptors	1) Low	Traffic impacts, aesthetics, during construction	Traffic impacts to Fens, impacts to park, aesthetics	Not applicable, utilization of existing facility
	2) Moderate			
	3) Severe			
LONG TERM COMMUNITY IMPACTS o Public acceptance o Maintenance impacts o Operations impacts	1) Low	Odor impacts to park and residents, increase O&M over existing conditions.	Aesthetics, increase over existing O&M, odor control to nearby institutes	Not applicable, utilization of existing facility
	2) Moderate			
	3) Severe			
ENVIRONMENTAL IMPACTS o Hazardous Waste o Wetlands o Tidelands o Other	1) Low	No environmental constraint observed	Located in buffer zone of Fens	Not applicable, utilization of existing facility
	2) Moderate			
	3) Severe			
ALTERNATIVE SUMMARY/RANKING		1	2	1

* Numerical values: 1 = Few, if any, implementation constraints; 2 = Potential difficult implementation; 3 = Potentially prohibitive implementation.

**Cottage Farm construction has the access and temporary road requirement issue

RATING OF SITING ISSUES FOR LOWER CHARLES

PARAMETER	NUMERICAL VALUE*/ MEASURE	Stony Brook Consolidation, Deep Rock Tunnel/storage			Charles River tunnel, Stony Brook Consolidation, tunnel/shaft at Ward Street Headworks	
		Stony Brook	Charlesgate Gatehouse	Cottage Farm	Stony Brook	Ward Street Headwork
SITE AVAILABILITY o Vacant land o Park land o Residential o Commercial/Industrial o Vacant Industrial	1) Multiple sites/few restrictions 2) Limited sites/site restrictions 3) No site/severe restrictions	Consolidation conduit placed within roadways and Southwest Corridor 2	Site adjacent to existing facility 1	Tunnel/ shaft located adjacent to Cottage Farm on MDC park land 1	Consolidation conduit placed within roadways and Southwest Corridor park 2	Tunnel/shaft located adjacent Ward Street Headworks 1
	1) Standard construction 2) Construction constraints 3) Unique & for special construction required	Conduit constraints in southwest corridor; Potential hazardous waste along Southwest Corridor ROW (soft ground tunneling) 3	Standard construction applicable 2	Tunnel/shaft site is sensitive 2	Conduit constraints in southwest corridor; Potential hazardous waste along Southwest Corridor ROW (soft ground tunneling) 3	Tunnel/shaft is standard construction; Potential hazardous waste located under parking lot 2
SHORT TERM COMMUNITY IMPACTS o Traffic impacts o Sensitive receptors	1) Low 2) Moderate 3) Severe	Conduit impacts to schools elderly housing, parks, residences 3	Impacts to Storow Drive 3	Tunnel/shaft impacts to school, park, Memorial Drive, and residences 2	Conduit impacts to schools, elderly housing, parks, residences 3	Tunnel/shaft impacts to multi-family residences, hospital, education institutions, and vent-worth institute parking 3
	1) Low 2) Moderate 3) Severe	Not Applicable 2	Historic, aesthetic acceptance issues 2	No increase over existing conditions 1	No maintenance or operations impacts 2	Minor impacts over existing condition 2
ENVIRONMENTAL IMPACTS o Hazardous Waste o Wetlands o Tidelands o Other	1) Low 2) Moderate 3) Severe	No wetlands observed 1	Adjacent to Charles River 1	Wetland resources on river bank 2	No wetlands observed 1	No environmental resources observed 1
ALTERNATIVE SUMMARY/RANKING						

* Numerical values: 1= Few, if any, implementation constraints; 2 = Potential difficult implementation; 3 = Potentially prohibitive implementation.

**Cottage Farm construction has site access and temporary road requirement issues

RATING OF SITING ISSUES FOR ALEWIFE BROOK

PARAMETER	NUMERICAL VALUE*/MEASURE	AB1	AB2/AB4	AB3/AB5/AB7	AB6	AB8
SITE AVAILABILITY	1) Multiple sites/few restrictions 2) Limited site/site restrictions 3) No site/severe restrictions	Sewer Separation 286 Acres	Consolidated near surface storage facility (1 year) 0.9 Acres, 7,700 L.F. Conduit	Consolidation/ Storage Conduit (1 year) 10,900 L.F. Conduit	Separate CAM004 3.6 Acres	Course Screening at each outfall
o Vacant land		Primarily in existing ROWs	Storage tank facility sites, vacant lot on Cambridge Park Drive, Alewife Brook Reservation adjacent lot opposite MBTA station, Parkway, etc.	Consolidation conduit parallel to existing pipe and Alewife Brook	Primarily in existing ROWs	Minimum site requirements, located at outfalls or nearby manhole
o Residential		1	Consolidation conduit tunnel along Alewife Brook Parkway, 2	2	1	1
o Commercial/Industrial						
o Vacant industrial						
CONSTRUCTABILITY	1) Standard construction 2) Construction constraints 3) Unique & for special construction required	Typical ROW construction issues	Conduit constraints along Alewife Brook Parkway (AGT, BeCo, Exon)- Tunnel construction required, Potential for hazardous waste along Alewife Parkway	Conduit constraints along Alewife Brook Parkway (AGT, BeCo, Exon pipes) bank; Potential for hazardous waste along Alewife Parkway	Typical ROW construction issues	Standard construction applicable
SHORT TERM COMMUNITY IMPACTS	1) Low 2) Moderate 3) Severe	Local street closings	Traffic and residences impacted with conduit construction	Traffic, park, and residences impacted with conduit construction	Local street closings	Minor traffic impacts to Alewife Parkway
o Traffic impacts		2	3	3	2	1
o Sensitive receptors						
LONG TERM COMMUNITY IMPACTS	1) Low 2) Moderate 3) Severe	No maintenance or operations impacts	O&M associated with storage facility	No substantial change to pump station operations	No maintenance or operations impacts	O&M associated with screens
o Public acceptance		1	2	1	1	2
o Maintenance impacts						
o Operations impacts						
ENVIRONMENTAL IMPACTS	1) Low 2) Moderate 3) Severe	Not Applicable	Wetlands observed at tank site and along Alewife Brook bank	Wetlands observed along Alewife Brook bank	Not Applicable	Outfalls located along Alewife Brook Bank
o Hazardous Waste						
o Wetlands						
o Tidelands						
o Other		1	2	2	1	2
ALTERNATIVE SUMMARY/RANKING						

* Numerical values: 1 = Few, if any, implementation constraints; 2 = Potentially difficult implementation; 3 = Potentially prohibitive implementation.

**CSO ALTERNATIVE SITE SCREENING
RECEIVING WATER: SOMERVILLE MARGINAL
CSO CONTROL SITE: SOMERVILLE MARGINAL CSO FACILITY**

PARAMETER	NUMERICAL VALUE*/ MEASURE	Sewer Separation	Upgrade Somerville Marginal to Storage (3 month)	Upgrade Somerville Marginal to Storage (1 year)	Upgrade Somerville Marginal to Primary Treatment	No Built- Continue present operations at Somerville Marginal	Deep Rock Tunnel
SITE AVAILABILITY • Vacant land • Park land • Residential • Commercial/Industrial • Vacant industrial	1) Multiple sites/few restrictions 2) Limited sites/site restrictions 3) No site/severe restrictions	Not Applicable	Few potential sites available on Foley Street and Surevant Ave.	Few potential sites available on Foley Street and Surevant Ave.	Few potential sites available on Foley Street and Surevant Ave.	Not Applicable	Few potential sites available on Foley Street and Surevant Ave.
CONSTRUCTABILITY	1) Standard construction 2) construction constraints 3) unique &/or special construction required	Not Applicable	Standard construction applicable	Standard construction applicable	Standard construction applicable	Not Applicable	Standard construction applicable
SHORT TERM COMMUNITY IMPACTS • Traffic impacts • Sensitive receptors	1) Low 2) Moderate 3) Severe	Local street closings	Minor traffic impacts (construction will most likely occur during relocation of 193)	Minor traffic impacts (construction will most likely occur during relocation of 193)	Minor traffic impacts (construction will most likely occur during relocation of 193)	Not Applicable	Minor traffic impacts (construction will most likely occur during relocation of 193)
LONG TERM COMMUNITY IMPACTS • Public acceptance • Maintenance impacts • Operations impacts	1) Low 2) Moderate 3) Severe	No maintenance or operations impacts	No maintenance or operation impacts	No maintenance or operation impacts	No maintenance or operation impacts	Not Applicable	No maintenance or operation impacts
ENVIRONMENTAL IMPACTS • Hazardous Waste • Wetlands • Tidelands • Other	1) Low 2) Moderate 3) Severe	Not Applicable	Probability of hazardous waste contamination associated with sites	Probability of hazardous waste contamination associated with sites	Probability of hazardous waste contamination associated with sites	Not Applicable	Probability of hazardous waste contamination associated with sites
ALTERNATIVE SUMMARY/RANKING							

*NUMERICAL VALUES: 1 = Few, if any, implementation constraints; 2 = Potentially difficult implementation; 3 = Potentially prohibits implementation.

CSO ALTERNATIVE SITE SCREENING
RECEIVING WATER: CHELSEA
CSO CONTROL SITE: CHE008

PARAMETER	NUMERICAL VALUE*/MEASURE	Sever Separation	Storage at CHE008 (3 month)	Storage at CHE008 (1 year)	Less than primary at CHE008	Deep Rock Tunnel (consolidation and tunnel/shaft)
SITE AVAILABILITY <ul style="list-style-type: none"> • Vacant land • Park land • Residential • Commercial/Industrial • Vacant industrial 	1) Multiple sites/few restrictions 2) Limited sites/site restrictions 3) No site/severe restrictions	Not Applicable	Site adjacent to Chelsea Creek Headworks	Site adjacent to Chelsea Creek Headworks	Site adjacent to Chelsea Creek Headworks	
CONSTRUCTABILITY	1) Standard construction 2) construction constraints 3) unique &/or special construction required	Not Applicable	Standard construction applicable	Standard construction applicable	Standard construction applicable	Open trench cut and other standard construction techniques applicable
SHORT TERM COMMUNITY IMPACTS <ul style="list-style-type: none"> • Traffic impacts • Sensitive receptors 	1) Low 2) Moderate 3) Severe	Local street closings	Highland Park	Highland Park	Highland Park	Local traffic impacts
LONG TERM COMMUNITY IMPACTS <ul style="list-style-type: none"> • Public acceptance • Maintenance impacts • Operations impacts 	1) Low 2) Moderate 3) Severe	No maintenance or operations impacts	Minor odor issues with Highland Park	Minor odor issues with Highland Park	Minor odor issues with Highland Park	Minor odor issues with Highland Park
ENVIRONMENTAL IMPACTS <ul style="list-style-type: none"> • Hazardous Waste • Wetlands • Tidelands • Other 	1) Low 2) Moderate 3) Severe	Not Applicable	No wetlands observed, potential hazardous waste within site area	No wetlands observed, potential hazardous waste within site area	No wetlands observed, potential hazardous waste within site area	No wetlands observed, potential hazardous waste within site area
ALTERNATIVE SUMMARY/RANKING						

*NUMERICAL VALUES: 1 = Few, if any, implementation constraints; 2 = Potentially difficult implementation; 3 = Potentially prohibits implementation.

RATING OF SITE ISSUES FOR PRISON POINT, UPPER INNER HARBOR

PARAMETER	NUMERICAL VALUE/ MEASURE	U11	U12	U13	U14	U15	U16	U17
SITE AVAILABILITY o Vacant land o Residential o Commercial/Industrial o Vacant/Industrial	1) Major sitelaw restrictions 2) Limited sitelaw restrictions 3) No sitelaw restrictions	Sewer Separation	Relief of Upstream Storage @ BOS017A BOS019 (TV)	Relief of Upstream Storage @ BOS017A BOS019 (3MA)	Prison Point Storage, BOS017 separation BOS019 Storage	Primary Treatment Prison Pt. Screen Disinfect BOS017A019	Primary Treatment Prison Pt. Screen BOS017A019	Deep Rock Tunnel
CONSTRUCTIBILITY 1) Standard construction 2) Moderate construction 3) Unique & for special construction required	Not Applicable	Not Applicable	Numerous sites available for BOS017, BOS019 has siting restrictions.	Numerous sites available for BOS017, BOS019 has siting restrictions.	Three sites available at Prison Pt. for deep shaft construction. MDC yard is also a potential site.	Site available for primary treatment at Prison Pt.	Site available for primary treatment at Prison Pt.	Site available at Prison Pt. facility.
SHORT TERM COMMUNITY IMPACTS o Traffic impacts o Sensitive receptors	1) Low 2) Moderate 3) Severe	Local street closings during construction	Standard construction is required for BOS019. Specialized construction for BOS019.	Standard construction is required for BOS019. Specialized construction for BOS019.	Deep shaft construction required at BOS015.	Standard construction is applicable.	Standard construction is applicable.	Standard construction is applicable.
LONG TERM COMMUNITY IMPACTS o Maintenance impacts o Operations impacts	1) Low 2) Moderate 3) Severe	No maintenance or operations impacts	Local traffic impacts, Berry playground, multi-family housing, CHY day care, CHY elderly housing	Local traffic impacts, Berry playground, multi-family housing, CHY day care, CHY elderly housing	None for BOS017, unless MDC parcel is utilized. Local street closings during sewer separation at BOS017.	No impacts anticipated.	No impacts anticipated.	No impacts anticipated.
ENVIRONMENTAL IMPACTS o Hazardous Waste o Wetlands o Tidelands o Other	1) Low 2) Moderate 3) Severe	Not Applicable	Minor odor issues, maintenance/operations impacts	Minor odor issues, maintenance/operations impacts	No impacts anticipated.	No impacts anticipated.	No impacts anticipated.	No impacts anticipated.
ALTERNATIVE			Probability of hazardous materials at BOS017.	Probability of contaminated site at BOS017.	Probability of contaminated site on MDC parcel.	None applicable.	None applicable.	None applicable.
SUMMARY/RANKING 1 = Potential difficult implementation; 2 = Potentially difficult implementation; 3 = Potentially prohibitive implementation.								

RATING OF SITE ISSUES FOR MYSTIC CHelsea CONFLUENCE / EAST BOSTON

PARAMETER	NUMERICAL VALUE/ MEASURE	MCC					MCC5 Consolidation, Equip. Storage, & Relocation to BOS003 (3 Mo)	MCC6 Consolidation, Equip. Storage, & Relocation to BOS003 (3 Mo)	MCC7
		MCC1 Sewer Separation	MCC2 East Boston Branch Sewer (3 Month)	MCC3 Near BOS003 (3 Mo)	MCC4 Consolidation & Local Storage at BOS014 (1-Year)	MCC5 Consolidation, Equip. Storage, & Relocation to BOS003 (3 Mo)			
SITE AVAILABILITY o Vacant land o Residential o Commercial/Industrial o Vacant/Industrial	1) Multiple sites/few restrictions 2) Limited site-specific restrictions 3) No site-specific restrictions	Not Applicable	Numerous routes identified for Waste Management St. may be problematic.	Not Applicable	Vacant at corner Engle St. & North St. Area.	Site available for screen disinfection facility.	Not applicable.	Not applicable.	Deep Rock Tunnel facility Site available at Prison Pl. facility
	1) Standard construction 2) Construction for special construction 3) Unique & for special construction required	Not Applicable	Due to elevation, open excavation, applicable technology.	Standard construction and or soil ground leveling	Standard construction permitted to sensitive to construction.	Sensitive construction permitted to HETA Blue Line	Not applicable.	Not applicable.	Standard construction is applicable.
SHORT TERM COMMUNITY IMPACTS o Traffic impacts o Sensitive receptors	1) Low 2) Moderate 3) Severe	Local street closings during construction	Local street closings during construction	Local street closings during construction	American Legion Playground residences, East Boston Recreation area.	Local traffic impacts, East Boston Recreation area.	No impacts anticipated.	No impacts anticipated.	Traffic impacts to Boston Marine Works, Porpo Park, Jaffris Pl, Yacht Club, residences, Spectacular play area.
	1) Low 2) Moderate 3) Severe	No maintenance or operations impacts	No maintenance or operations impacts	No maintenance or operations impacts	No maintenance or operations impacts	No maintenance or operations impacts	No impacts anticipated.	No impacts anticipated.	No impacts anticipated.
ENVIRONMENTAL IMPACTS o Hazardous Waste o Wetlands o Tidelands o Other	1) Low 2) Moderate 3) Severe	Not Applicable	Not Applicable	Not Applicable	Engle Street site located in area that may encounter contaminated soils.	No wetlands or other environmental constraints	None applicable.	None applicable.	May encounter hazardous waste contamination.
ALTERNATIVE SUMMARY/RANKING									

* Numerical values: 1 = Few, if any, implementation constraints;
2 = Moderate implementation constraints;
3 = Extensive implementation constraints.

CSO ALTERNATIVE SITE SCREENING
RECEIVING WATER: RESERVED CHANNEL
CSO CONTROL SITE: BOS076 AND BOS080

PARAMETER	NUMERICAL VALUE*/ MEASURE	Sewer Separation	Consolidation, screening and disinfection BOS076 (1 year)	Consolidation, screening and disinfection BOS076 (3 month)	Consolidation and near surface storage BOS080 (1 year)	Course Screening
SITE AVAILABILITY <ul style="list-style-type: none"> • Vacant land • Park land • Residential • Commercial/Industrial • Vacant industrial 	1) Multiple sites/few restrictions 2) Limited sites/site restrictions 3) No site/severe restrictions	Not Applicable	Tight siting (under private road), facility in Casey & Hayes lot	Tight siting (under private road), facility in Casey & Hayes lot	Sites located at Conley Marine Terminal and MDC park	Not Applicable
CONSTRUCTABILITY	1) Standard construction 2) construction constraints 3) unique &/or special construction required	Not Applicable				Not Applicable
SHORT TERM COMMUNITY IMPACTS <ul style="list-style-type: none"> • Traffic impacts • Sensitive receptors 	1) Low 2) Moderate 3) Severe	Local street closings	Need to keep East First St. open to truck traffic, neighborhood impacts at soft ground tunneling shafts	Need to keep East First St. open to truck traffic, neighborhood impacts at soft ground tunneling shafts	Residences, East First Street playground	Not Applicable
LONG TERM COMMUNITY IMPACTS <ul style="list-style-type: none"> • Public acceptance • Maintenance impacts • Operations impacts 	1) Low 2) Moderate 3) Severe	No maintenance or operations impacts	No maintenance or operation impacts	No maintenance or operation impacts	No maintenance or operation impacts	Not Applicable
ENVIRONMENTAL IMPACTS <ul style="list-style-type: none"> • Hazardous Waste • Wetlands • Tidelands • Other 	1) Low 2) Moderate 3) Severe	Not Applicable	Tidelands	Tidelands	"Oily" odors at Conley Marine Terminal, tidelands	Not Applicable
ALTERNATIVE SUMMARY/RANKING						

*NUMERICAL VALUES; 1 = Few, if any, implementation constraints; 2 = Potentially difficult implementation; 3 = Potentially prohibits implementation.

RATING OF SITING ISSUES FOR FORT POINT CHANNEL

PARAMETER	NUMERICAL VALUE*/MEASURE	FPC1		FPC2			
		Sewer Separation 1068 Acres	Detention/treatment UPPS; Consolidation/storage conduit BOS072-073; coarse screen BOS062-068, and in-line storage. (3 month)	BOS072/073 0.5 Acres	UPPS 0.6 Acres	BOS062-068 0.3 Acres	DBC 0.3 Acres
SITE AVAILABILITY o Vacant land o Park land o Residential o Commercial/Industrial o Vacant Industrial	1) Multiple siting/new restrictions 2) Limited sites/site restrictions 3) No site/severe restrictions	Primarily in existing ROWs		Located at outfalls	The UPPS parcel can accommodate a detention/storage facility	Located at outfalls or nearby manholes	Potentially problematic route/weaving between buildings for in-line storage of Dorchester Brook Conduit 2
CONSTRUCTABILITY	1) Standard construction 2) Construction constraints 3) Unique & /or special construction required	Typical ROW construction issues 1 2	Vibration; Hazardous waste anticipated with conduit route	2	1	1	
SHORT TERM COMMUNITY IMPACTS o Traffic impacts o Sensitive receptors	1) Low 2) Moderate 3) Severe	2	Parking Impacts to consolidation	2	2	1	2
LONG TERM COMMUNITY IMPACTS o Public acceptance o Maintenance impacts o Operations impacts	1) Low 2) Moderate 3) Severe	2	no O&M impacts associated with conduit	2	2	1	1
ENVIRONMENTAL IMPACTS o Hazardous Waste o Wetlands o Tidelands o Other	1) Low 2) Moderate 3) Severe	1	Immediately adjacent to water	2	2	1	1
ALTERNATIVE SUMMARY/ RANKING		1	Not Applicable	2	1	1	1

* Numerical values: 1 = Few, If any, Implementation constraint;
2 = Potential difficult implementation; 3 = Potentially prohibits implementation.

RATING OF SITING ISSUES FOR FORT POINT CHANNEL

		FPC3			
PARAMETER	NUMERICAL VALUE/ MEASURE	Screen and Disinfect UPPS, BOS072, 073 course screen BOS062-068 and in-line storage (3 month)			
		BOS072/073 0.5 Acres	UPPS 0.5 Acres	BOS062-068 0.3 Acres	DBC 0.3 Acres
SITE AVAILABILITY o Vacant land o Park land o Residential o Commercial/Industrial o Vacant Industrial	1) Multiple sites/few restrictions 2) Limited sites/site restrictions 3) No site/severe restrictions	BOS073 has a potential screening facility site within the Gillette parking area	The UPPS parcel can accommodate a detention/ storage facility	Located at outfalls or nearby manhole	Gate structure & pump-out structure required. Existing line location must be determined
	1) Standard construction 2) Construction constraints 3) Unique & /or special construction required	2	1	1	2
CONSTRUCTABILITY	1) Standard construction 2) Construction constraints 3) Unique & /or special construction required	BOS073 storage facility site could accommodate standard construction procedure. Potential for hazardous waste contamination at Gillette (old industrial land)	UPPS storage facility site could accommodate standard construction procedure	Standard construction anticipated	Pressure Relief Ports in conduit
	1) Low 2) Moderate 3) Severe	2	2	1	2
SHORT TERM COMMUNITY IMPACTS o Traffic impacts o Sensitive receptors	1) Low 2) Moderate 3) Severe	Gillette parking area	Elderly housing behind existing UPPS and housing immediately across street from site.	Minor temporary traffic impacts	Minor temporary traffic impacts
	1) Low 2) Moderate 3) Severe	2	2	1	1
LONG TERM COMMUNITY IMPACTS o Public acceptance o Maintenance impacts o Operations impacts	1) Low 2) Moderate 3) Severe	Minor impacts with facilities	Minor odor issues with storage to housing	No maintenance or operation impacts	No maintenance or operation impacts
	1) Low 2) Moderate 3) Severe	2	2	1	1
ENVIRONMENTAL IMPACTS o Hazardous Waste o Wetlands o Tidelands o Other	1) Low 2) Moderate 3) Severe	Immediately adjacent to channel		At or near outfalls	
	1) Low 2) Moderate 3) Severe	1	1	1	1
ALTERNATIVE SUMMARY/RANKING					

- Numerical values: 1 = Few, if any, implementation constraints;
2 = Potential difficult implementation; 3 = Potentially prohibits implementation.

RATING OF SITING ISSUES FOR FORT POINT CHANNEL

PARAMETER	NUMERICAL VALUE / MEASURE	FFC4			Deep Rock Tunnel and consolidation (1 year)
		BOS072/073 0.3 Acres	BOS062-068 Coarse screen BOS062-068, 072, and 073; and receiving water controls BOS070	BOS070 0.5 Acres	
SITE AVAILABILITY o Vacant land o Park land o Residential o Commercial/Industrial o Vacant Industrial	1) Multiple sites/low restrictions 2) Limited sites/site restrictions 3) No site/severe restrictions	Not Applicable for coarse screens	Located at outfalls or nearby manholes	Receiving water control site currently RR track storage and vehicle /truck parking	CAT design an issue for shaft/tunnel siting
		1	1	1	2
CONSTRUCTABILITY	1) Standard construction 2) Construction constraints 3) Unique & /or special construction required	Standard/Not Applicable	Standard/Not Applicable	Standard/Not Applicable	CAT design an issue
		1	1	1	2
SHORT TERM COMMUNITY IMPACTS o Traffic impacts o Sensitive receptors	1) Low 2) Moderate 3) Severe	Minor temporary traffic impacts	Minor temporary traffic impacts	Minor temporary traffic impacts	Location dependent upon CAT design
		1	1	1	2
LONG TERM COMMUNITY IMPACTS o Public acceptance o Maintenance impacts o Operations impacts	1) Low 2) Moderate 3) Severe	No maintenance or operation impacts	No maintenance or operation impacts	No maintenance or operation impacts, aesthetic impacts from receiving water controls	No maintenance or operation impacts
		1	1	3	1
ENVIRONMENTAL IMPACTS o Hazardous Waste o Wetlands o Tidelands o Other	1) Low 2) Moderate 3) Severe	At or near outfalls	At or near outfalls	Working in water	
		1	1	2	2
ALTERNATIVE SUMMARY/ RANKING					

- Numerical values: 1 = Few, if any, implementation constraints;
2 = Potentially difficult implementation; 3 = Potentially prohibits implementation.

